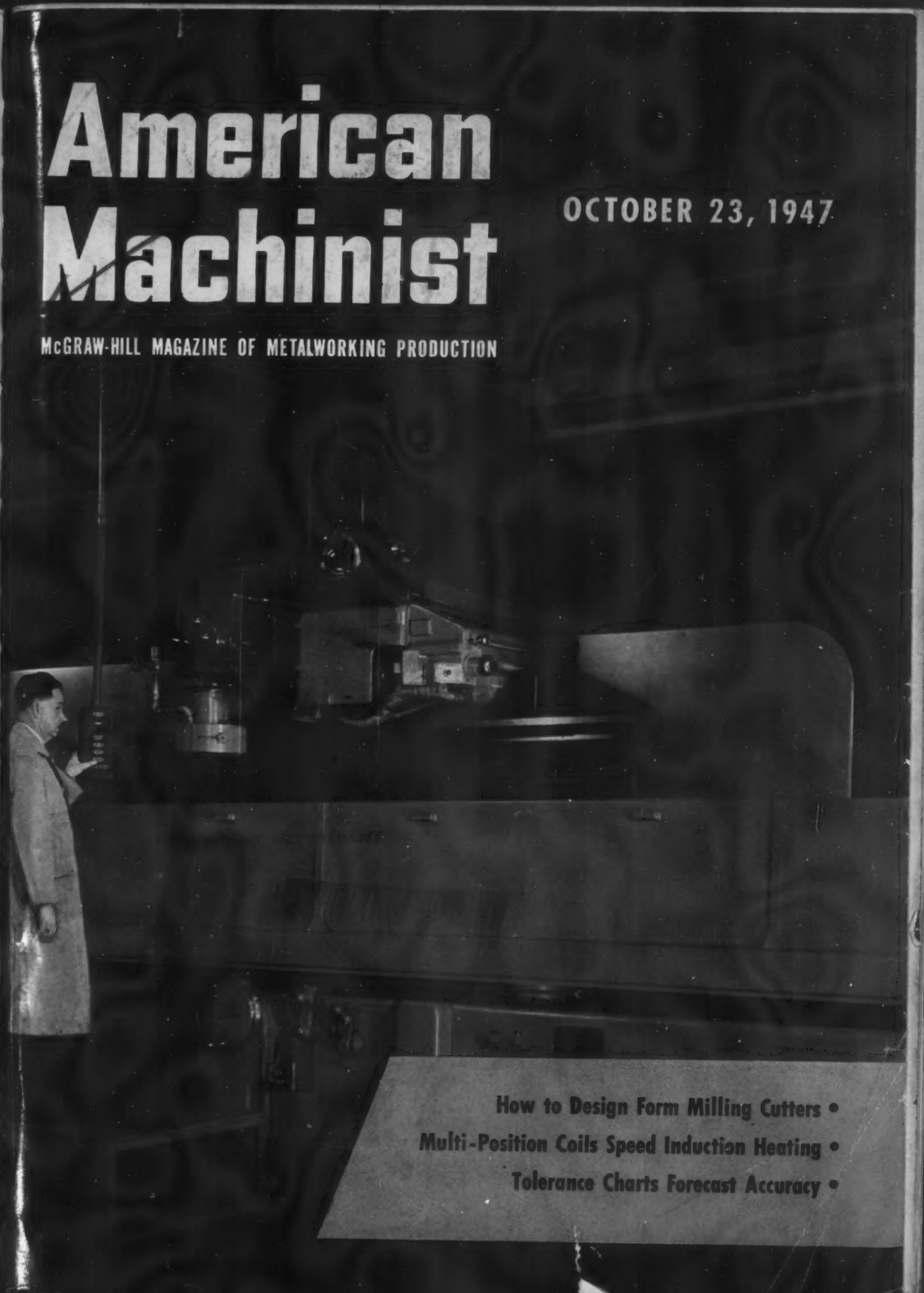
American Machinist

OCTOBER 23, 1947

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



How to Design Form Milling Cutters •

Multi-Position Coils Speed Induction Heating •

Tolerance Charts Forecast Accuracy •

LATEST DEVELOPMENT
IN AUTOMATIC GRINDING

"GAGE-SIZE" means combination Gage-Matic and Size-Matic automatic sizing controls—*both* in this new Heald No. 271 Internal.

Heald's brand NEW Internals grind more holes... faster... at less cost

HERE'S THE ANSWER to your large scale grinding problems — a complete *new line* of Heald Gage-Matic and Size-Matic Internals, *the result of over 20 years' experience in automatic grinding development.* This new line includes a model exactly suited to your particular job.

Grinding cycles are entirely automatic once the work is loaded and the starting lever advanced. You obtain extremely accurate results and maximum production with minimum effort. The reason is improved construction, new design.

NEW FEED MECHANISM enables cross-feed cycle and table speeds to be instantly and accurately set for rate and amount... lessens setup time.

UNIFORM SPEEDS AND FEEDS remain constant throughout the day without adjustment... maintain definite production, finish and accuracy.

SEALED HYDRAULIC SYSTEM prevents leaks and entry of coolant or dirt... insures long life and trouble-free operation.

CENTRALIZED CONTROLS • ANTI-FRICTION WHEELSLIDE PERMANENTLY LUBRICATED WHEELHEADS • COMPACT DRESSER • ISOLATED HYDRAULIC RESERVOIR.

All these features help to make the new Heald Internals more convenient to operate and easier to maintain. For specific applications, get in touch with the Heald branch office nearest you.

ANOTHER OF *18 NEW* HEALD MACHINES

SEND FOR *FREE* BULLETIN on the Heald Nos. 271-371 Automatic Internal Grinding Machines. Complete with photographs, features, specifications. Write

HEALD

THE HEALD MACHINE COMPANY, Worcester 6, Mass.

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York

TECHNOLOGY DEPARTMENT

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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Chips and QUIPS

Our Cover . . . A new type of grinder for lathe beds, 36 x 48 x 240 in., made by The Thompson Grinder Company for the Hendey Machine Company, is the subject of our cover Kodachrome. Our picture is a closeup of the center section with the lathe bed in position.

This is a new development in grinding machine-tool ways, for the machine has a double-spindle arrangement, one horizontal for grinding the flats and vees on top of the lathe bed, the other vertical for grinding the under side of the ways and the rack seat.

Replacement Lesson . . . We continue our series on working machine-tool replacement policies with a description of that followed by Dodge Mfg. Corp. by E. M. Carver, first vice-president. Dodge depreciates at a fast 10% a year, reinvests in new equipment the same year.

Tool Tips . . . Tool engineers fare well, with the second in James Matter's series on cost reduction, a mobile finish analyzer, tricks with a gear shaper, and an authoritative story on designing form-milling cutters, plus the regular diet of Practical Ideas.

Mr. Matter describes the tolerance chart, a little-known graphical method for anticipating, and correcting beforehand, trouble with tolerances. It's worth study and adoption.

A. A. Goodman, supervisor, Gage Laboratory, of the Steam Division of Westinghouse, describes a mobile unit they've developed for analyzing surface finish. . . . Then in sketch-and-caption treatment, we show how a gear shaper, that hybrid between engine lathe and crank shaper, can be used for a dozen specialized jobs hard to handle by other means.

Every editor expects 1% of his job to be inspirational and the other 99% perspirational as he hunts suitable articles. But every so often, a contributor turns the tables on us and gives us an article we're not expecting. That's called an "over the transom" contribution. H. M. Huffman of Cincinnati Milling Machine turned that table-turning trick on us with his story on design of form-milling cutters, which we liked well enough to make it the lead in this issue.

No Special Report . . . To balance our Oct. 9, wherein were two special reports, one on diamond dies and one on the Machine Tool Show, and to give the editors a quick breather after their premium-size issues in the theoretical vacation season, we give you an issue without a special report. But we're in the habit, so this issue contains ten major articles, plus usual shorts and departments. . . . Charles Mills and Ken Unter conclude their joint stint on designing thin-metal stampings, set the stage for yet another of Mr. Mills' articles now in preparation. . . . Frank Curtis also concludes his series of three on induction heating, this one dealing with multiple-position coils and describing a recent development that again broadens the field of this versatile method.

Materials . . . We come up with two stories in this general classification. One, from G. R. Kepner, director of headquarters production for Westinghouse, describes a Stock Location Manual which coordinates departmental stocks and saves time and money. . . . Then E. M. Argersinger, supt. of materials handling for Kaiser-Frazer, describes the central control he uses in organizing his department.

Coming . . . Harry Wharen, the tool-grinding editor, scores again with one of his pet subjects, cleaning metals, as our special report for Nov. 6. Our original space allotment was 8 pages —which he insisted on doubling. . . . Starting in that issue also is a series on uses of petroleum oils in hydraulic systems—really practical stuff. . . . Then there are articles on carbon brazing, an assembly conveyor and a turntable, Ford's soda-water filter, a tricky die for making all-steel box-car runways, and several other features.

JAMES K. MATTER, author of a series of articles on cost reduction for tool engineers, the second of which appears in this issue, is currently associated with the Pioneer Engineering & Mfg. Co., Detroit, Mich. He is engaged in plant survey, cost reduction and materials-handling consultant jobs. A graduate from Carnegie Tech., Pittsburgh, B.S. degree, he did postgraduate work at Cornell leading to his M.E. degree. At present Mr. Matter is working at designing the forms and writing a manual for the installation of a production-control system in a new tractor plant.

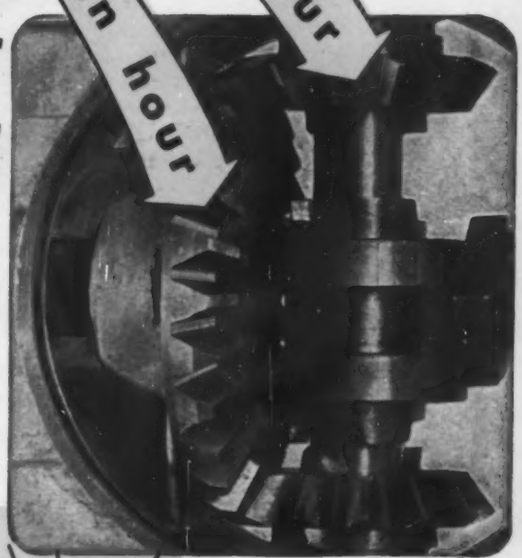
He has been associated in the past with such companies as Firestone Tire & Rubber Co., R.C.A., Aluminum Cooking Utensil Co., Aluminum Products Co., Excelsior Machinery & Equip. Corp. in various capacities ranging from production superintendent to general manager.

FASTEST EQUIPMENT EVER DEVELOPED

FOR CUTTING STRAIGHT BEVEL GEARS

86 an hour

49 an hour



GLEASON No. 8 STRAIGHT BEVEL REVACYCLE MACHINE

High quantity production of straight bevel gears such as those for the household washer... from blank to finished gear, including burring ... cut from the solid by means of a single cutter carrying both roughing and finishing blades ... the No. 8 Straight Bevel Revacycle Machine is entirely automatic, equipped with loading device and hydraulic chucking.

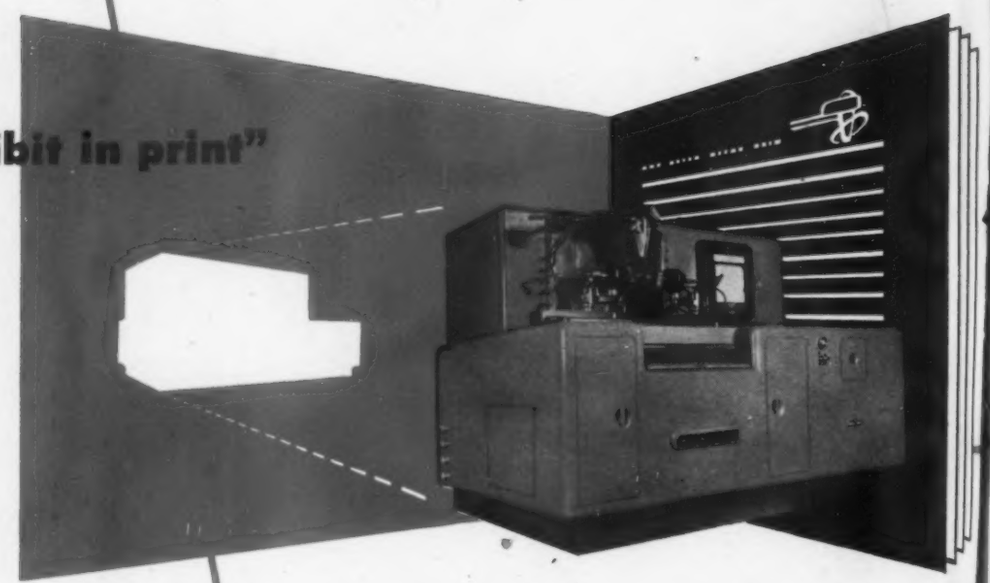
GLEASON Works
1000 University Avenue
Rochester 3, N.Y., U.S.A.

Builders of Bevel Gear Machinery for Over Eighty Years

if you missed flamatic

a new word learned by thousands of Metal Show visitors

get this "exhibit in print"



Patents pending

A complete 20-page picture story of the new Cincinnati Flamatic Hardening Machine—the flame hardening machine with electronic temperature control.

Flamatic is a high production machine with which you can surface harden parts—consistently—to metallurgical standards and within dimensional tolerances never before achieved with flame hardening.

Flamatic means development of full surface hardness, controlled depth of heat penetration, and negligible distortion. The machine will handle parts that lend themselves to rotation, up to 8 inches diameter, others up to 18 inches long.

write for publication no. M-1611

CINCINNATI

THE CINCINNATI

flamatic

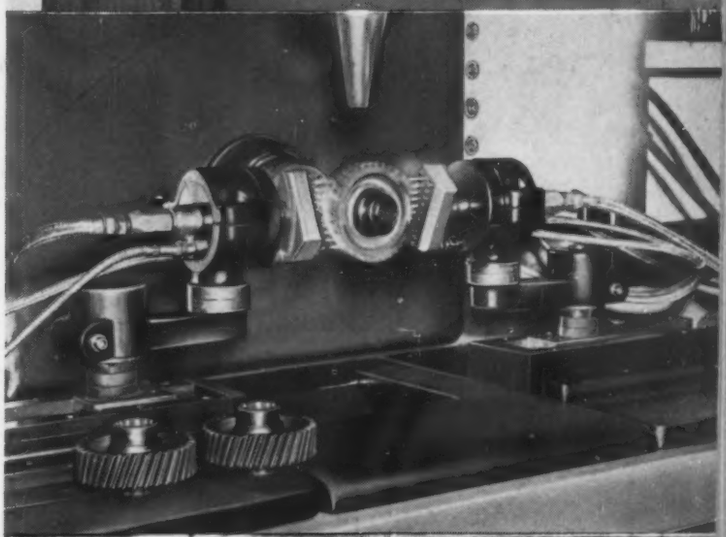
FLAME HARDENING MACHINE

load work then touch button

Work starts rotating, flames ignite and heat the surface while . . .

an electronic eye watches temperature

"Reports" to master control unit. The moment the surface reaches desired preset temperature . . .



part is deposited into quench automatically

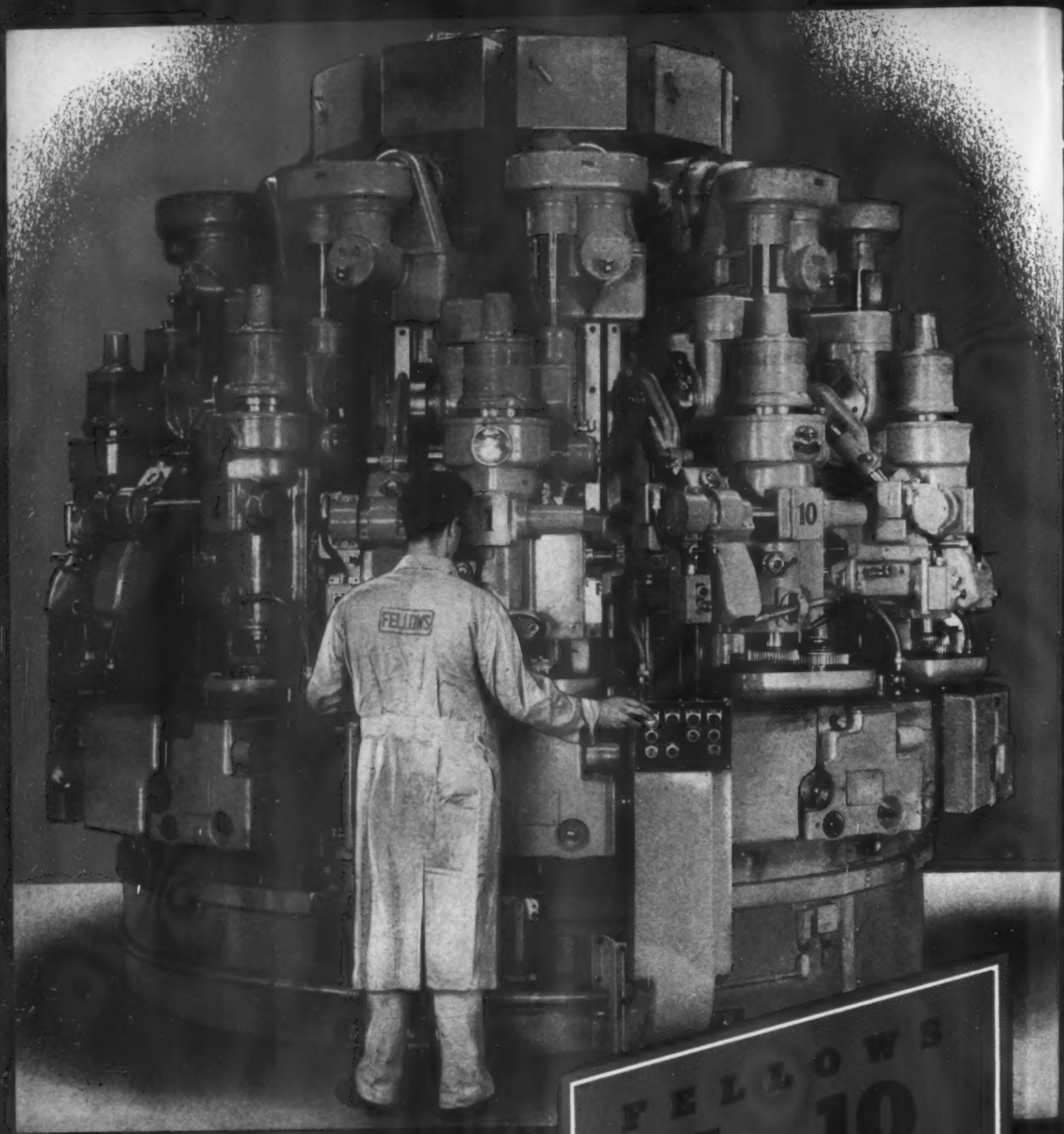
Speed heating, precision temperature control, and quenching medium used result in unusual uniformity and minimum distortion.

parts come clean

Delivered out of quench on endless conveyor, can be collected or picked up by another conveyor. Except for loading parts, Flamatic operation is fully automatic.

THE CINCINNATI MILLING MACHINE COMPANY

cincinnati 9, ohio, u.s.a.



For Production Gear Cutting

FELLOWS
No. 10 ROTARY

ADAPTED TO THE CUTTING OF EX

Completely New!

A ten-unit independently controlled Fellows gear shaper, turret-mounted to rotate on a single base . . . 85,000 pounds of massive efficiency . . . an outstanding new design capable of taking heavy cuts at high speed, and using cutters up to 6 inches diameter. Each independent "station" and the entire machine is electrically controlled for automatic, time-cycled and time-saving operation . . . record production rates! Traditional Fellows precision output and versatility. Write for a new bulletin on the No. 10 Rotary Gear Shaper.

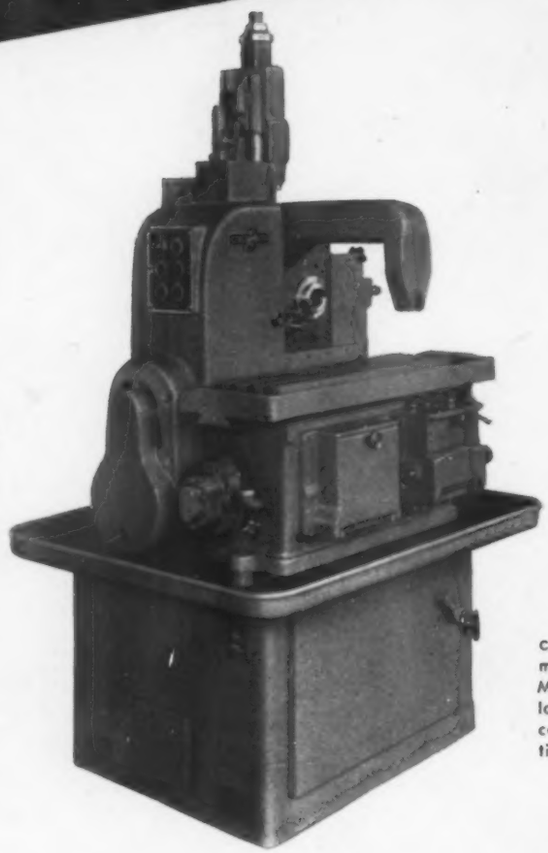
The Fellows Gear Shaper Company, Head Office and Export Department, Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2; 640 West Town Office Bldg., Chicago 12; 7706 Empire State Bldg., New York 1.

• *A Fitting Companion to the Planetary Gear Shaper*

Fellows METHOD

OF EXTERNAL AND INTERNAL SPUR AND HELICAL GEARS

CINCINNATI presents a new 0-8 for faster...safer...Automatic Milling operations



CINCINNATI 0-8 Automatic Rise and Fall Milling Machine. Catalog M-1607 contains complete specifications.

Quite often, speed and safety are total strangers to each other, but not to the operator of a new CINCINNATI 0-8 Automatic Milling Machine. It has effective safety features for both the operator and machine, as well as a high productive capacity. Just consider these four advantages offered by the new 0-8:

PRODUCTION is speeded by table rapid traverse rate of 400 inches per minute.

PRODUCTION is speeded by twenty spindle speeds, 80 to 3000 rpm.

SAFETY for the operator is increased through automatic spindle stop. (Cutter is stationary while operator loads and unloads fixtures.)

SAFETY for the machine is increased through completely automatic, filtered lubrication.

Speed of production and safety of operation are companion advantages offered by the new 0-8 Automatics. And they have many other features of value in high production milling operations on small parts. Whether or not you saw them at the recent Machine Tool Show, you may obtain complete data by writing for catalog M-1607.

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

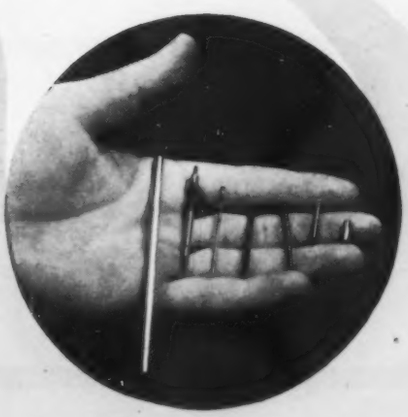
MILLING MACHINES CUTTER SHARPENING MACHINES BROACHING MACHINES

This new CINCINNATI FILMATIC Centerless

...The No. 0...

Specializes in small parts

CINCINNATI FILMATIC No. 0 Centerless Grinding Machine. Complete information may be obtained by writing for catalog No. G-576.



The hand holds several parts ground on a CINCINNATI FILMATIC No. 0 Centerless.

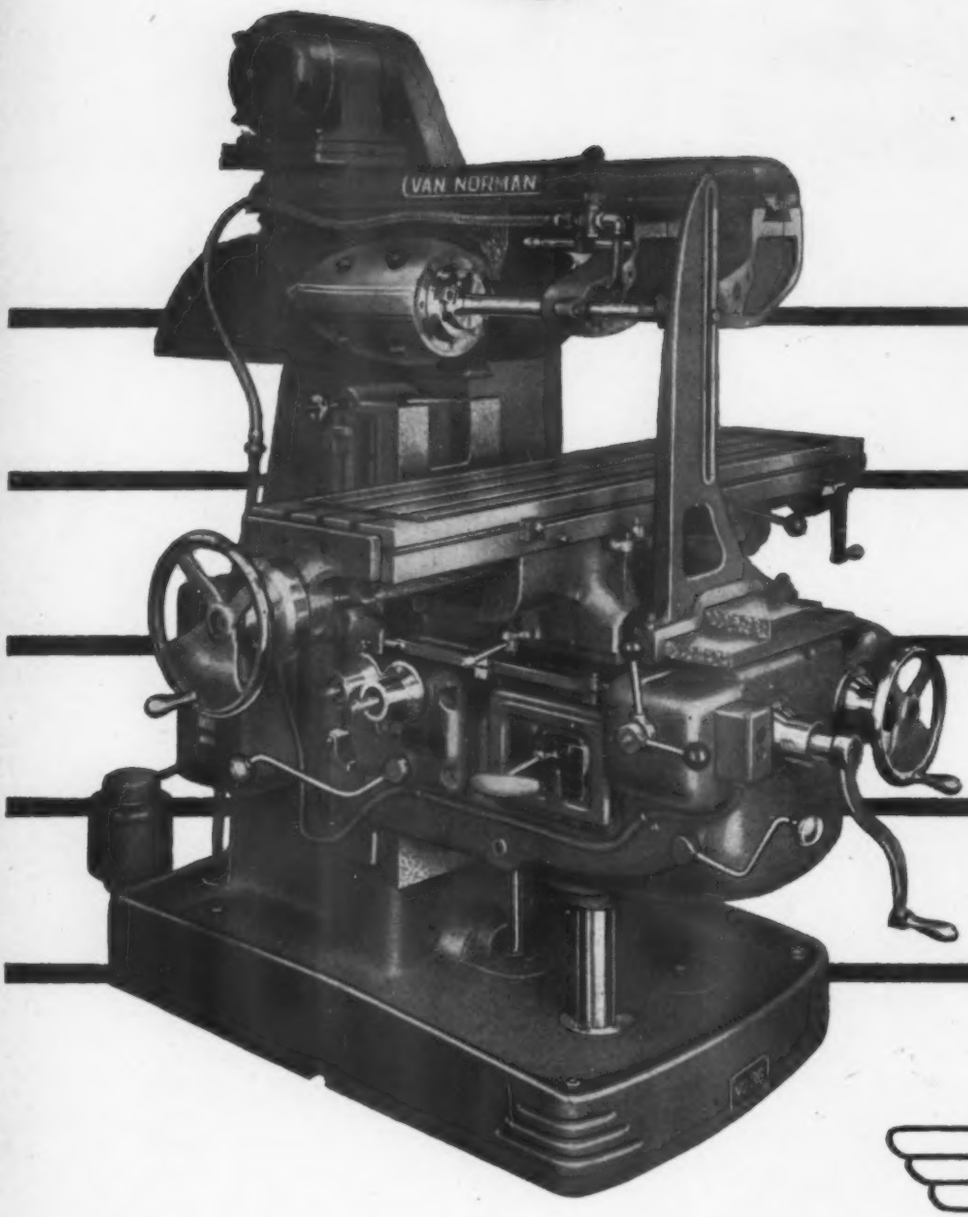
Specialists are unusually good at their chosen line of work... they outproduce the best jack-of-all-trades. And that's why the new CINCINNATI FILMATIC No. 0 Centerless is a specialist in its line; it leads the field in grinding small parts to precise limits and at a low cost. It has much to offer manufacturers of small drills; clock and instrument parts; shafts, pinions and bushings for business machines; parts for high-grade mechanical toys. The No. 0 is the smallest of a line of six CINCINNATI FILMATIC Centerless Grinding Machines. Complete specifications will be found in catalog No. G-576. Write for copy.

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTER TYPE GRINDING MACHINES CENTERLESS LAPPING MACHINES CENTERLESS GRINDING MACHINES

5 REASONS ...with Van Norman



No. 36 With adjustable cutterhead mounted in horizontal milling position.

"It Pays to Van Normanize"

WHY YOU PROFIT

Ram Type Milling Machines

Adjustable Cutterhead permits you to perform horizontal, angular or vertical milling all on one machine . . . minimizes work setups . . . cuts idle operator and machine time up to 50%. In addition, this versatility enables you to meet daily job to job milling requirements.

Increased Range—the adjustable cutterhead and movable ram provide maximum milling capacity and versatility.

Front and Rear Finger-tip Controls of all power feeds, six way rapid traverse and hand adjustments provide extreme ease of control . . . reduce work fatigue . . . improve accuracy. Power controls operate in the desired table, saddle and knee movement assuring maximum simplicity of operation.

Single Lever Feed Selector provides quick, easy selection of the proper feed for the type of work being milled. 18 feeds are instantly available from front or rear operating positions.

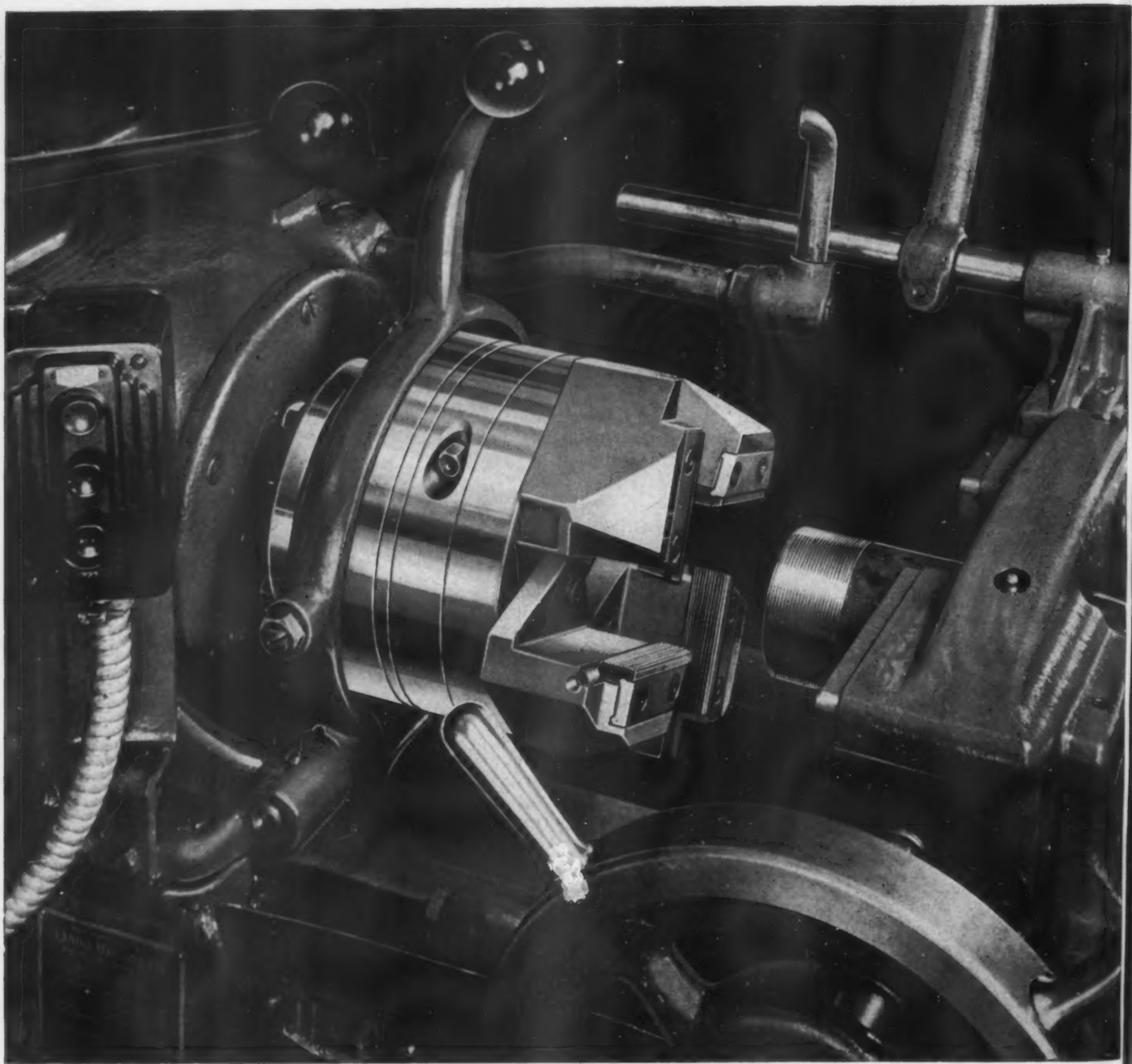
Long Life Accuracy is assured by the precision rigid Van Norman construction. Hardened alloy steel gears and multi-splined shafts operate on anti-friction bearings . . . automatic lubrication assures thorough oiling of all moving parts . . . massive knee, saddle and table assemblies provide rigidity.

Investigate Van Norman Ram Type Millers today. They are available in many models and sizes, with plain or universal saddles, to meet every requirement for toolroom, laboratory, machine shop, pattern shop and general purpose milling.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

LANDMACO



The 1½" LANDMACO Single Head Leadscrew Threading Machine illustrated has a standard capacity of ⅜" to 1½". However, machine is equipped with 1½" LANCO Die Head fitted with oversize chaser holders for producing 3½" diameter 12 pitch threads on pump stators.

LANDIS
REG. U.S. TRADE-MARK PAT. OFF.

LANDIS

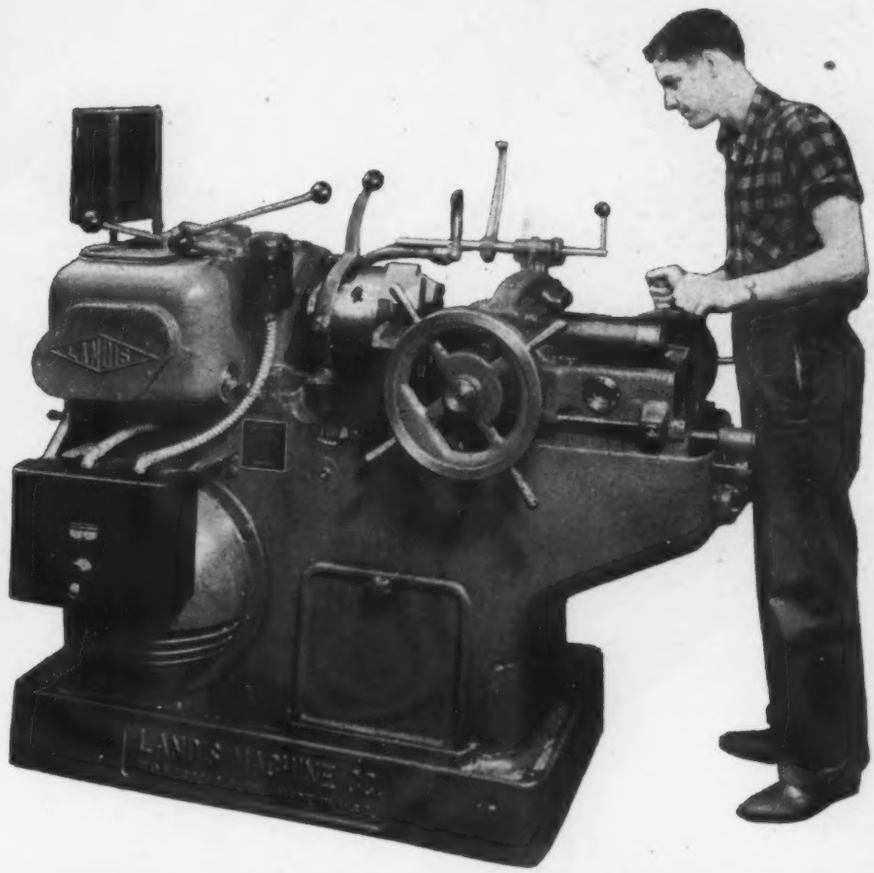
THREADING MACHINES

For Speed, Accuracy and Economy on a Wide Variety of Threading Jobs

Nine outstanding features—eight speed selective type gear box, vertical and horizontal adjusted carriage front; leadscrew attachments; anti-friction bearings on which gear shafts, leadscrews and spindles operate; wipers for bed guides; rack and pinion operated carriage; silent chain drive; and semi-steel bed cast in one piece with transverse bracing members; as well as double wall support for machine guides.

LANDMACO Threading Machines are built in 1" and 1½" Single, Double and Quadruple models as well as 2" and 2½" Single and Double models.

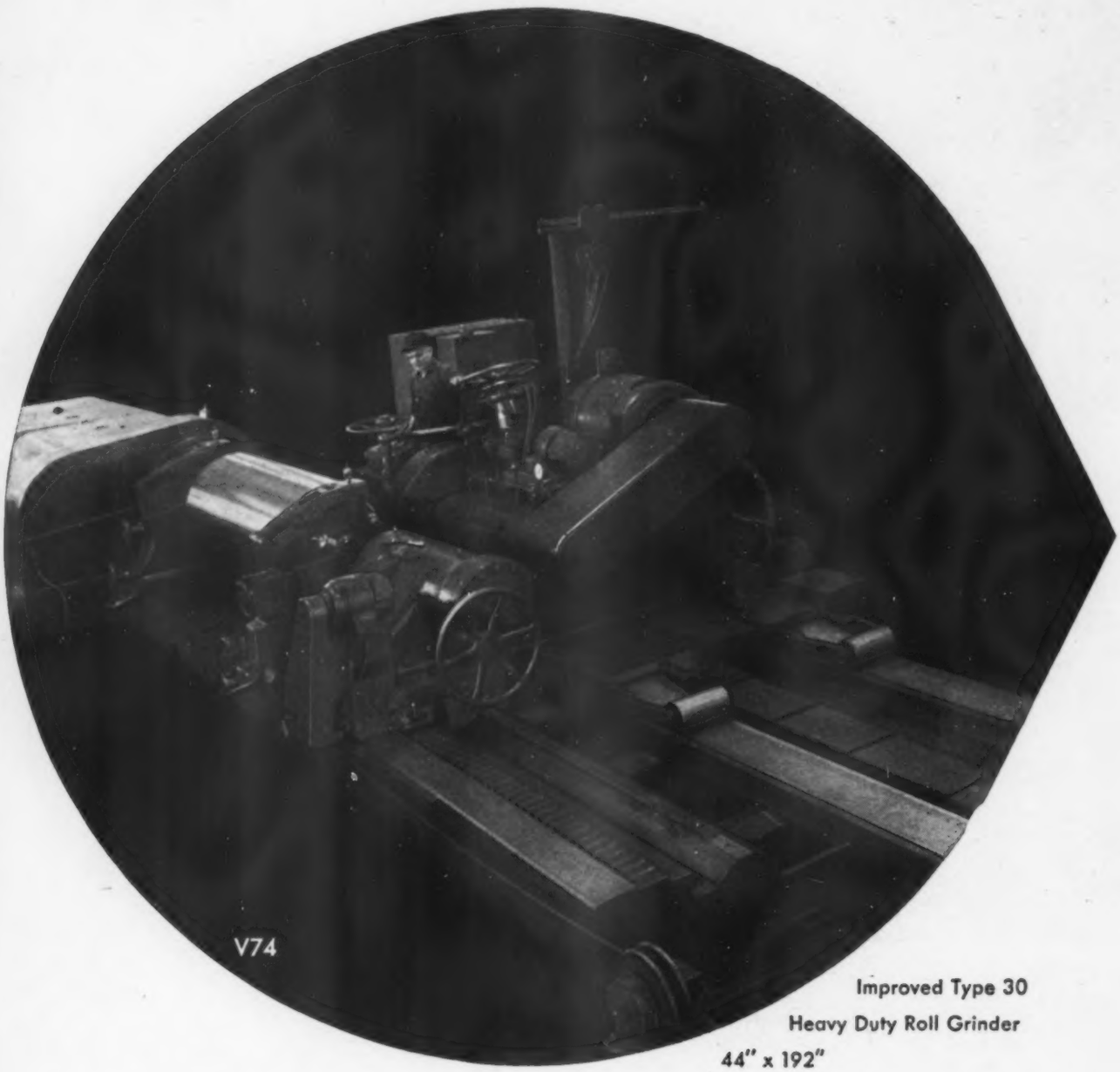
Send for Bulletin H-75



MACHINE CO. WAYNESBORO PENNA. U.S.A.

FASTER–more accurate roll grinding

grinding from rough in one operation/saves 14 hours per roll



Improved Type 30
Heavy Duty Roll Grinder
44" x 192"

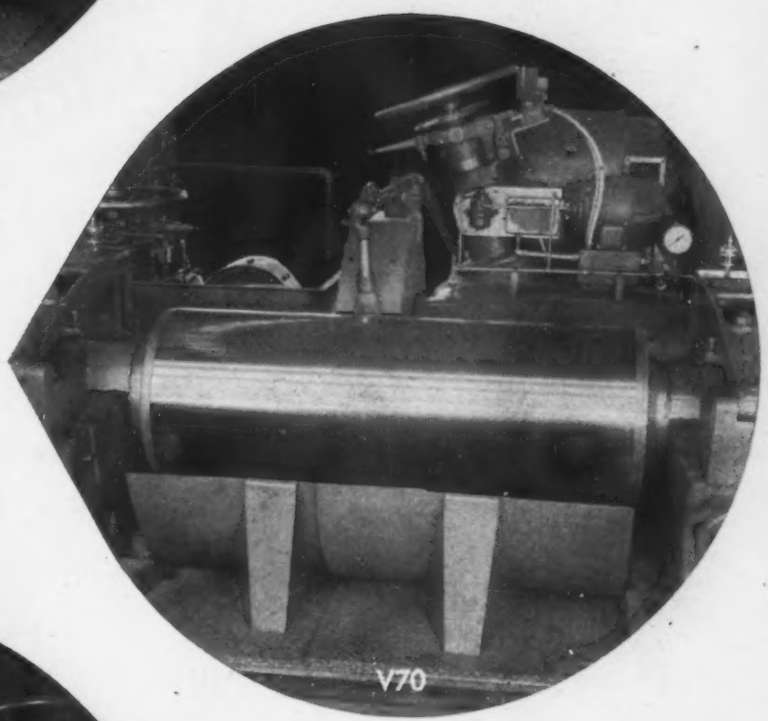
LANDIS TOOL
Precision Grinders

save 14 hours per roll

before	2½ days turning and finish grinding.
now	Grinding from rough, 6 hours, one operation.

for grinding all types of rolls

size	19" to 45" diameter by 24" to 120" length of body, weighing 4100 to 81,000 lbs.
materials	Nickel, chromium and molybdenum alloy steel and alloy iron.
shapes	Straight, crowned, concaved, taper (for necks)
types	Slabbing, broadside, back-up, hot, cold, sheet, plate.

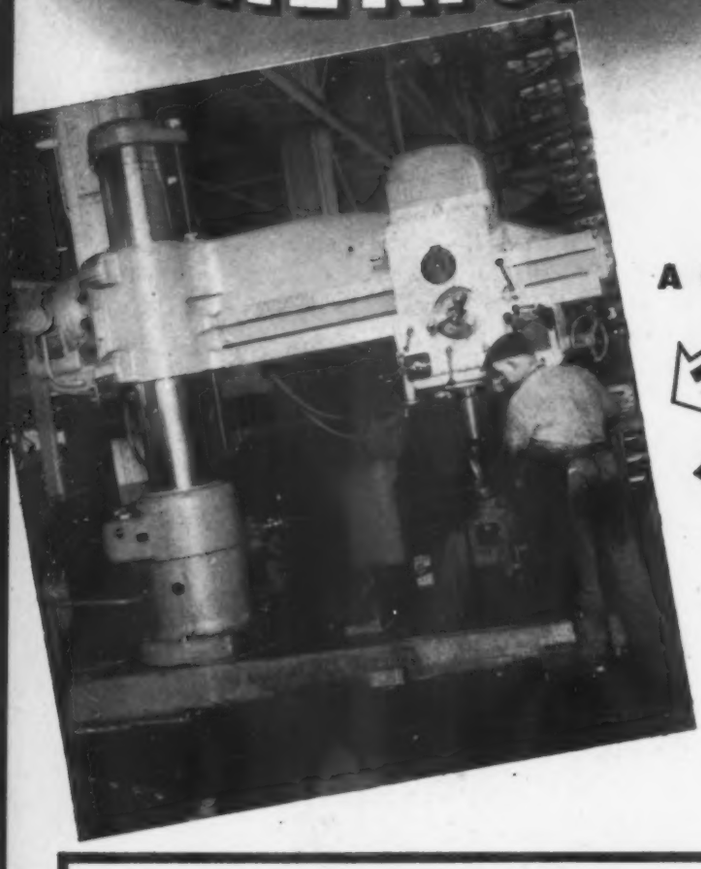


Controls Convenient for Operator

LANDIS TOOL COMPANY/WAYNESBORO, PENNA.

"AMERICAN" Versatility

An Asset in the Railroad Shop!



A QUICK CHANGE FROM

THIS

...to THIS

This "American" Hole Wizard Radial in the C. & O. R. R. Shops at Huntington, W. Va., seems to be a "jack of all trades."

As shown by the accompanying illustrations, one minute it's reaming cross head fits, the next it's on an emergency job drilling ¾" holes.

The Hole Wizard's wide range of speeds, its concentration of all controls at the head, its patented Double Lo-Hung Spindle Drive, great power and rigidity make it an outstanding machine for both production jobs and miscellaneous work of various kinds.

THE "AMERICAN" HOLE WIZARD IS A BULWARK OF PRODUCTION IN THE SHOP.

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills

COVEL'S STARS OF THE SHOW-

Still Getting "CURTAIN CALLS" by the Score

"After-the-Show" inquiries are still pouring in at COVEL'S—because COVEL "Stars of the Show" Grinders made a lasting impression on everyone who saw them work. If you're one of those who hasn't already asked for more information, do so now. The COVEL line offers your best chance to save money in toolroom and on production line.

Model 22

Universal Cutter and Tool Grinder

For fast, precision conditioning of all types of cutters and tools. Now available as demonstrated at the Show with Rapid Action Saddle and Reversible Spindle. This model, as well as Models 12 and 6 exhibited at the Show, is available with a full line of special attachments.

Model 20

Hydraulic Feed 6" x 18" Surface Grinder

For high production on long or short runs. Hard chrome table ways, sealed spindle, ample strength for heavy cuts, and extreme rigidity for accuracy—all mean low-unit cost and high-speed precision finishes.

YANKEE TWIST DRILL GRINDER

Double-end combination permits precision grinding of drills from No. 30 to 4" diameter. Inexperienced operators with little instruction can do a perfect job on any size drill. Precision ground drills last longer, do better work, and drill more holes between grindings.

Ask

FOR BULLETIN A-157

This bulletin explains in detail the new COVEL features demonstrated at the Show.

COVEL MANUFACTURING CO.
BENTON HARBOR, MICHIGAN, U.S.A.

COVEL
INDUSTRIAL GRINDERS

'32 ALUNDUM ...

NORTON COMPA
ALUNDUM
WORCESTER MASS

Its Cost-cutting Ability Now PROVED

by a Year of Sensational Performance!

THE sensational performance of 32 ALUNDUM grinding wheels is no longer a prediction—*it is now an established fact*—definitely proved in thousands of plants the country over by a solid year of steadily increasing use. The reason for their outstanding success is 32 ALUNDUM abrasive —*entirely different from any other abrasive*— made without crushing by a Norton developed and patented process.

"32" Wheels Are Sharper

Each grain of 32 ALUNDUM abrasive forms as a single, complete crystal with many sharp points on all sides for faster, cooler cutting.

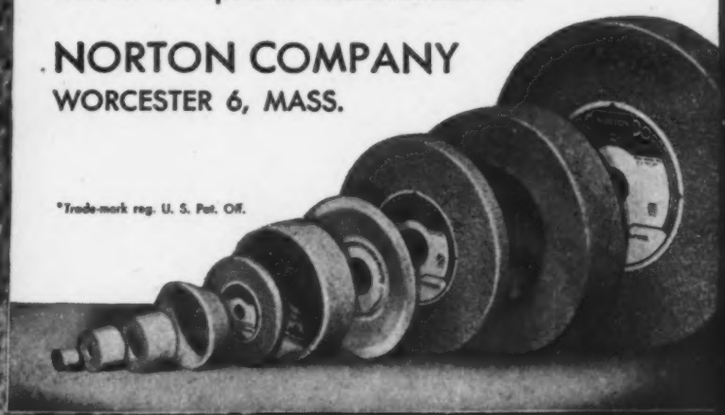
"32" Wheels Contain More Usable Abrasive

The grains of 32 ALUNDUM abrasive are over 99% pure fused alumina—no non-cutting slag nor pores. Their greater resistance to dulling gives longer wheel life.

32 ALUNDUM grinding wheels are available in *all standard sizes*—in both regular and open structures. They can cut costs for you on cylindrical, centerless, surface, tool and internal grinding. Ask your Norton abrasive engineer or Norton distributor for specific recommendations.

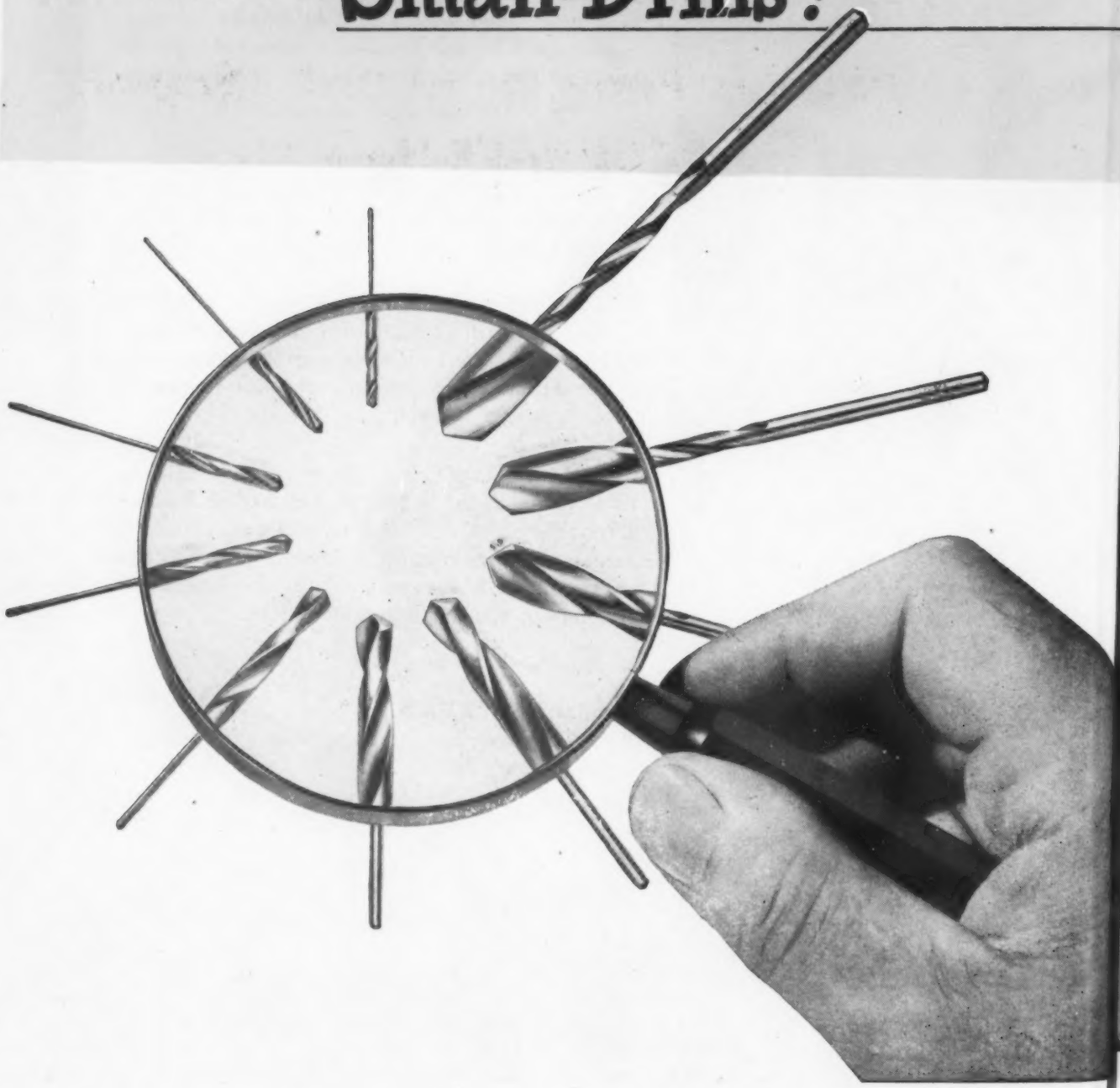
NORTON COMPANY
WORCESTER 6, MASS.

*Trade-mark reg. U. S. Pat. Off.



NORTON ABRASIVES

Magnifying Glass Shows Clue to Lower Costs with Small Drills!



Morse "Multi-Inspection-Test-Control"

Provides Peak Small Drill Quality for ACCURATE Hole Size

We've placed these little fellows under the magnifying glass for a better look. Morse checks and tests and checks again, at every step of the manufacturing process. When a drill has been okayed by the Morse multi-inspection system, the user is certain of a small drill made to the closest tolerances — a tool that's dimensionally accurate with just the right degree of hardness and toughness — a drill that's scientifically ground and precision pointed.

Remember too, Morse small drills are *double-drawn* for increased toughness while maintaining their predetermined degree of hardness . . . and given special heat treatment to assure uniformity. Result: tools that appreciably lower small part production costs and step up "line" efficiency via *accurate* size holes drilled faster.

Whether your needs call for "bantam" size drills or the big Morse "block busters," Morse has the tool to cut down your costs. Your Industrial Supply Distributor can aid you in obtaining the proper Morse recommendation for *your* job on small or large drills and other high quality cutting tools.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

The Original Manufacturer of Twist Drills

NEW BEDFORD, MASSACHUSETTS

New York Store: 130 Lafayette St. • Detroit Store: 2952 East Grand Blvd. • Chicago Store: 570 West Randolph St. • San Francisco Store: 1180 Folsom St.

116% MORE POWER PER POUND . . .

Up to 134% more starting torque per pound of motor . . . with as much as 116% more maximum torque per pound! As much as one third smaller . . . yet stronger mechanically AND electrically than any previous Westinghouse induction motor!

That's the achievement represented in the Westinghouse Life-Line—the biggest single advance in fundamental motor design in 58 years.

It wraps up in one solid steel-encased package, user preferences formerly obtainable only as custom-built features, if at all.

It makes available to industry, in a standard line of motors, improvements perfected for special wartime requirements.

Life-Line Motors are now in production at the new Buffalo Westinghouse Motor Plant, in frame sizes representing the popular demand of induction motor ratings. Check your nearest Westinghouse office for availability, or write Westinghouse Electric Corporation, P. O. Box 2025, Buffalo 5, N. Y.

J-21408

WESTINGHOUSE

Westinghouse

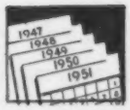
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Life-Line motors

ALL-STEEL PROTECTION

All frames, feet and brackets are HEAVY STEEL. Stators are far stronger... new core locking device eliminates rivets.

NO LUBRICATION FOR 5 YEARS



No greasing is needed for AT LEAST FIVE YEARS. Bearings are pre-lubricated... sealed against dirt and moisture.

NEW QUIET SMOOTHNESS

Life-Lines cut vibration and noise to new low limits for standard motors... satisfy many "special motor" needs.

LESS SPACE PER HP

Life-Line Motors occupy less space per hp than any other standard motor... are easier to build into machines and install in cramped quarters.

IMPROVED WINDINGS

New insulating materials... coil winding techniques ... stator slot designs... give new record-setting protection against electrical failures.

NEW SLEEK LINES

The Life-Line has sleek lines ... a smooth finish... discourages dust and dirt accumulations... harmonizes with modern machine and tool design.

ALLIS-CHALMERS
Pre-Engineered

COMPLETE AUTHORITATIVE PRACTICAL

— ONLY ALLIS-CHALMERS OFFERS YOU THIS ADVANCED ENGINEERING

THIS IS the most complete V-belt drive reference book ever published. It contains:

PRE-ENGINEERED DRIVE TABLES—1 to 150 hp, thumb-indexed for quick reference. Just turn to the page you want — read off the complete drive data.

ENGINEERING TABLES — sheave dimensions — drive selections — general information. Everything carefully arranged and indexed for easy figuring of special drives.

Book contains 144 pages, size 8½ by 11 inches. Thumb index and classified index make it easy to use.

ANNOUNCES
Texrope Drives

..and a NEW Texrope Manual that Makes Selection Easy

THIS MANUAL marks a revolutionary advance in the application of V-belt drives. It enables every user to select, with unerring accuracy, the one *best* drive for any normal requirement. It eliminates guesswork, figuring and chance for error. It assures greatest possible economy and efficiency in the use of Texrope V-belt drive equipment.

SOLVES 90% OF ALL V-BELT DRIVE SELECTION PROBLEMS

Texrope Pre-Engineered stock drives tables have been worked out in a complete range of speeds, for horsepowers from 1 to 150. These tables show, in one place, the correct drive for any requirement. Each is the *one best drive* for the job, as pre-engineered by the finest V-belt engineering staff in the world.

MOST ECONOMICAL, IN BOTH FIRST COST, MAINTENANCE

Every Pre-Engineered drive selection is made up of regular Texrope stock items. No special-order equipment is required. You can't make the mistake of buying a larger, more expensive drive than you really need, or of installing an underpowered drive that will be costly in performance and maintenance. Texrope Pre-Engineered drive selections are the *best* engineered drives — in low first cost — in performance — in reduced maintenance.

THE RESULT OF 22 YEARS OF V-BELT EXPERIENCE

Only Allis-Chalmers has developed a complete Pre-Engineered drive manual. It is more than the work of slide-rules or the rearrangement of old tables. It includes the industry's greatest V-belt drive experience—the knowledge and judgment gained through 22 years of building and studying V-belt drives for every industrial application.

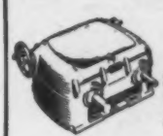
Copies of this new manual have been sent to many Texrope users and dealers. If you have not received one, write for Texbook No. 20P40. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN. A 2249

TEXROPE .. Greatest Name in V-Belt Drives

"Super 7" V-BELTS
Five Types — Sizes to suit every power transmission job.

Texsteel, Texdrive, "Magic-Grip"
— sheaves in a full range of sizes, grooves.

"Vari-Pitch" SHEAVES
Exact variations in speed, stationary or motion control.



SPEED CHANGERS
Speed variations up to 375% at the turn of a crank.

ENGINEERING
Finest V-Belt engineering talent in the world—at your call.

TEXROPE "Super 7" V-Belts result from the cooperative research of two great companies — Allis-Chalmers and B. F. Goodrich. They are sold only by A-C.

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

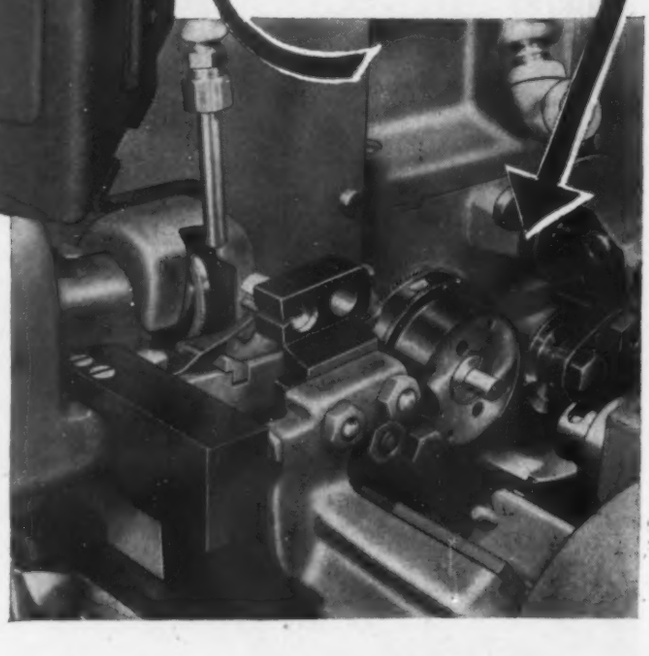
1847 1947
A CENTURY OF SERVICE to Industry THAT MADE America Great

FASTER PRODUCTION...

NEW-DESIGN AUTOMATIC SCREW THREADING MACHINE

Capacity . . . 3/8" hole through largest finger. Threads any length to 1". Greatest distance from front of chuck to face of die, 2 7/8"; least, 1/8".

Speed Range . . . there's a range of die and spindle speeds suitable for any material.



Close-up showing work spindle and threading spindle. Both rotate in same direction at different speeds . . . the *difference* is the effective threading speed. Threading dies are backed off simply by automatic stopping of threading spindle.

UNUSUALLY HIGH PRODUCTION is possible on certain types of work because this machine has been specifically designed to take full advantage of overlapping operations and to reduce idle time to a minimum.

Set-ups and operation are easy, and long life assured because all the latest refinements and improvements in design and construction have been incorporated in this new Brown & Sharpe Machine. Write for complete specifications. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

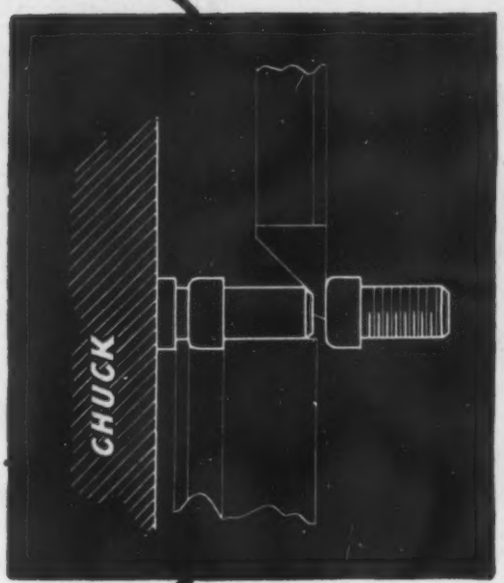
BROWN &

OF SMALL SCREWS, NUTS, BUSHINGS . . .

by OVERLAPPING OPERATIONS

HERE'S HOW! Both the work spindle and the threading spindle of this new-design, automatic screw threading machine rotate in the same direction but at different speeds. The difference in speeds permits the die or tap to cut at the required surface speed for threading while the work rotates at suitable speed for turning or other operations. Diagram at right shows simultaneous tandem production of a screw. Threading and cutting-off (partial) are performed on one piece while initial operations are being performed on succeeding piece.

For the production of bushings, a die spindle is available as a drill spindle.



MANY ATTACHMENTS ADD WIDE VERSATILITY . . . ELIMINATE REHANDLING AND USE OF SECOND MACHINE

Automatic Rod Magazine . . . especially valuable, since this machine uses stock so rapidly.

Vertical Slide Attachment . . . makes increased production possible on certain classes of work by leaving both cross slides available.

Longitudinal Turning Attachment . . . permits efficient production of screws with proportions beyond regular forming capacity.

Burring Attachment . . . carries a single tool for chamfering or taking other light cuts on cut-off ends of bushings and similar pieces of work.

Nut Tapping Attachment . . . provides for efficient production of nuts and similar internally-threaded parts. Permits one nut to be tapped while blank for next nut is being made.

Index Drilling Attachment . . . indexes and drills one piece while the machine is producing another. In some cases entire drilling time is saved.

Other Attachments . . . Silent Stock Support, Slabbing Holder, Attachment Driving Stand.

SHARPE

B·S

SOUTH BEND 16" PRECISION LATHES

16" x 6' South Bend Precision Toolroom Lathe **$1958.00**

PROMPT DELIVERY

Immediate delivery of some models from distributors' stocks. Others available for early factory delivery.

PRICES

South Bend Lathes now represent a greater value per dollar of cost than ever before. The average price increase over prewar level is less than 15%.

TIME PAYMENTS

South Bend Lathes and accessories are available on Time Payment Terms. 25% down—12 mo. to pay. Moderate finance charge.

The accuracy and versatility of South Bend 16-inch Swing Lathes improve the quality of toolroom work, facilitate tooling, and save machining time. Toolmakers like them. These same features — plus their large capacity, ease of operation, and dependability—step up production work. All these advantages make possible the manufacture of better products at lower costs.

In addition to the lathes shown, South Bend Engine Lathes and Toolroom Lathes are available with 9", 10", 13", and 14½" swings. Also Precision Turret Lathes with ½" and 1" maximum collet capacities. Write for catalog, stating the size lathe in which you are interested.

16" x 6' South Bend Precision Engine Lathe **$1567.00**

16" x 12' South Bend Precision Engine Lathe **$1863.00**

Prices are f. o. b. South Bend, do not include electrical equipment, and are subject to change without notice.

Features and Specifications of 16" Precision Lathes

Toolmakers like them

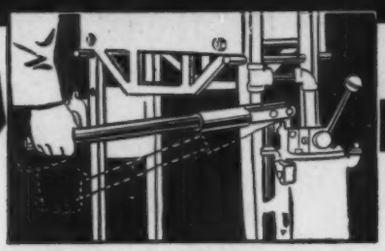
Swing Over Bed and Saddle Wings	16¼"
Swing Over Saddle Cross Slide	9⅝"
Bed Lengths	6, 7, 8, 10, and 12 feet
Distance Between Centers	33½" to 105½"
Spindle Speeds (8)	21 to 725 r. p. m.
Power Longitudinal Feeds (48)	.0015" to .0841"
Power Cross Feeds (48)	.0006" to .0312"
Thread Cutting (48 pitches)	4 to 224 per inch
Maximum Collet Capacity	1"
Spindle Bore	1⅜"
Cross Slide Travel	10½"
Compound Rest Top Slide Angular Feed	3¾"
Tailstock Spindle Feed	5¾"
Tailstock Top Set-Over	1"

BUILDING BETTER LATHES SINCE 1906

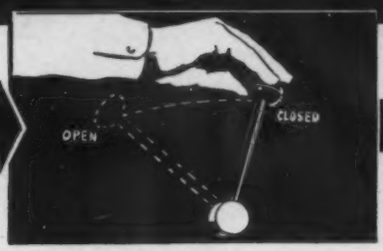
SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • SOUTH BEND 22, INDIANA

These KRW Hydraulic Arbor Press Features ...

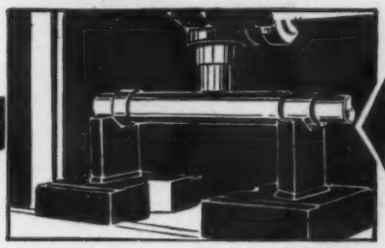


Fast Action, cylinder is filled as ram travels to work. You get tons of pressure with first pump stroke.

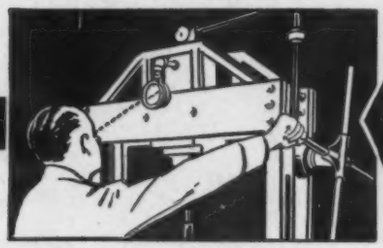


Finger Tip Control opens and closes valve in a jiffy. No gripping effort assures easier, faster operation.

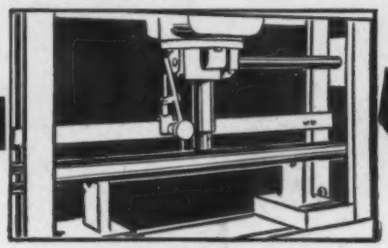
KRW Built-in Mechanical Press permits up to 3 tons pressure for straightening small diameter work.



One Piece, All Steel V-Blocks have machined surfaces for greater accuracy; usable upright or inverted.

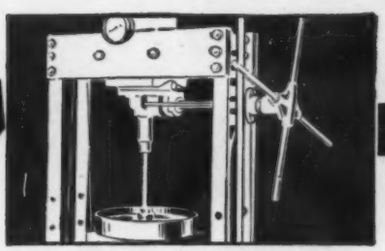


Highly Visible Pressure Gauges are mounted where they can be quickly checked. Read in tons and pounds.

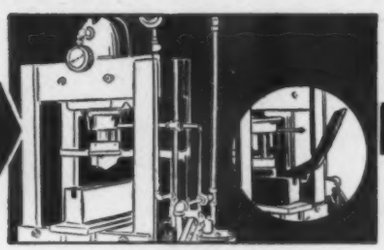


Micrometer Dial Attachment permits great accuracy in checking work without removing from V-block.

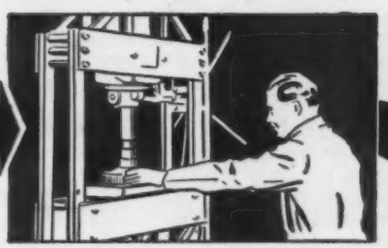
Reduce Costs ON THESE AND OTHER DAILY Production Jobs ...



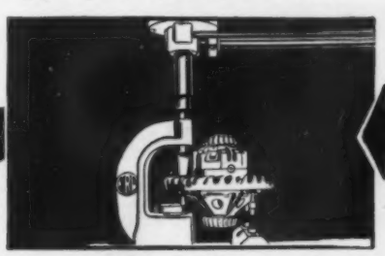
Broaching a key way in a flywheel. 7½ inch ram travel makes many broaching jobs practical on KRW Presses.



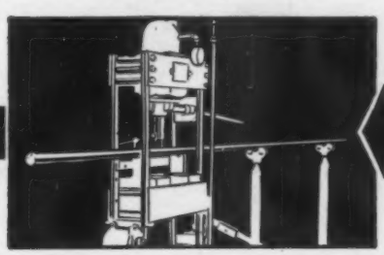
Bending in production lots with simple, inexpensive dies is easily done on low-cost KRW Hand-operated Presses.



Pressing of all types is efficiently handled. Adjustable bed makes pressing on long shafts a very simple operation.



Riveting with KRW Riveting Attachment is simplicity itself. Many KRW Presses are used for this type work.



Straightening, especially on long work, is easy on a KRW Press because of its special open-end construction.

Blanking is easy with simple die set for short-run operations. Releases regular equipment for quantity production.

Write for the **NEW KRW** *Catalog.....*

K·R·WILSON

215 MAIN STREET, BUFFALO 3, N. Y.

K. R. WILSON, 215-217 Main St., Buffalo 3, N. Y.

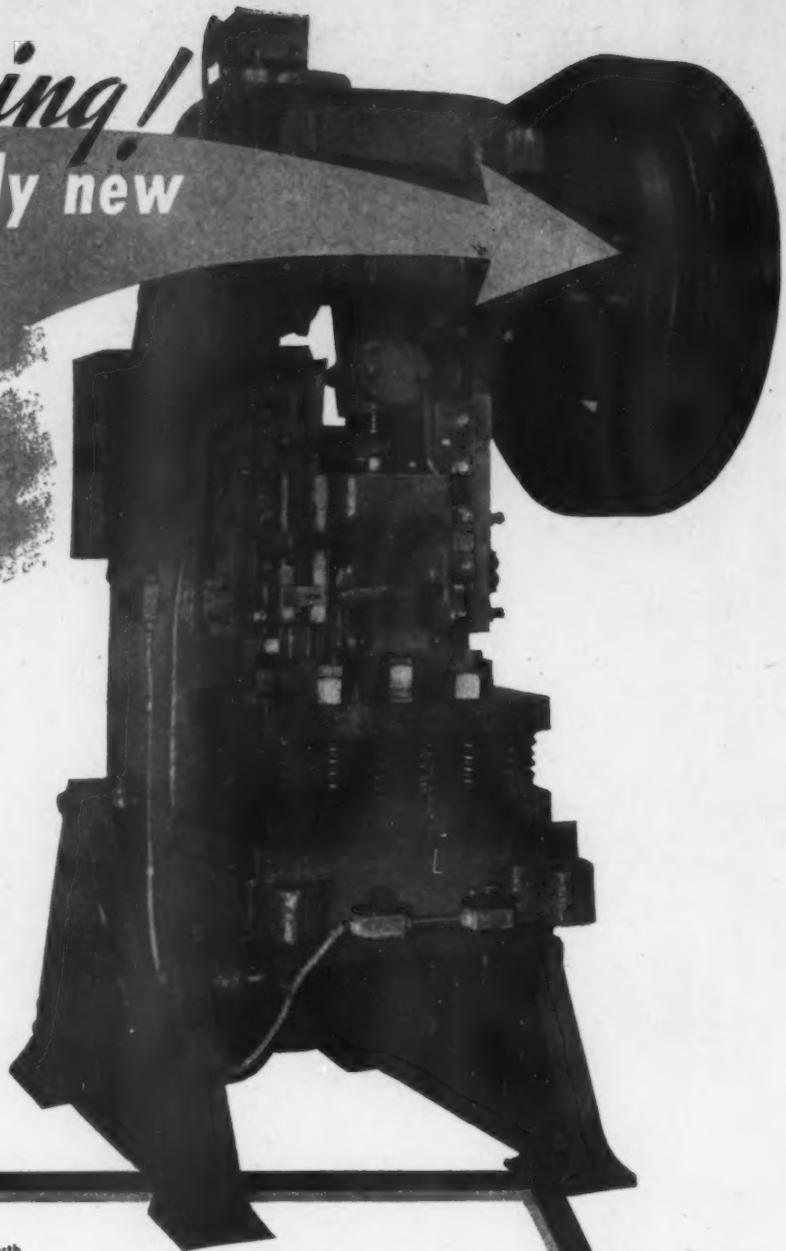
Please mail me a copy of your Hydraulic Arbor Press Catalog 11

Name .....

Address .....

City ..... *Zone* ..... *State* .....

Announcing! an entirely new DRUM TYPE (pat's. pend.) AIR FRICTION CLUTCH



This new Cleveland Drum Type Air Friction Clutch and Brake (Pat's. Pend.) is not merely a conventional disc type Clutch incorporating a few minor changes or improvements, but a radically new design which incorporates the Clutch and Brake into a combined unit of one-piece construction, with 14 features for efficiency and economy of operation.

Furthermore, this Drum Type Clutch has approximately half the number of parts and is about one-fourth the weight of a disc clutch and, due to the lightness in weight, quicker starting and stopping is assured and there is also a considerable saving in the horsepower required to operate the Clutch.

Designed by Cleveland Engineers to meet the demand of Power Press users for an exceptionally dependable Clutch, this Drum Type Clutch, which has been subjected to every conceivable test, and the critical inspection of many leading Pressed Metal manufacturers, will soon be available in a complete range of sizes for either flywheel or back geared machines.

CHECK THESE 14 IMPORTANT FEATURES OF THIS SENSATIONALLY NEW DRUM TYPE (Pat's. Pend.) AIR FRICTION CLUTCH.

- Approximately one-fourth the weight of a conventional disc friction Clutch of equal capacity.
- Approximately half the number of parts of a conventional disc friction Clutch
- Light weight assures considerable saving in horsepower required to operate the Clutch.
- The design and lightness of parts contributes to quicker starting and stopping.
- Complete disengagement of all idle friction surfaces eliminates drag, unnecessary wear and heat, and assures longer friction "life"
- Clutch is self-adjusting which results in easy maintenance and low upkeep.
- Can be serviced readily without removal from the Press.
- Air cylinders provide maximum performance with minimum amount of air.
- Positive brake brings machine to immediate stop in the event of failure of electric current or air supply.
- Clutch can be set to slip under overload.
- Clutch temperature remains slightly above room temperature — no excessive heating.
- Can be applied to any size new or old Press, flywheel or geared.
- Is mounted directly on the driveshaft.
- Combined unit of one-piece construction — Clutch and Brake cannot become separated or engaged simultaneously.

THE PRESS ILLUSTRATED IS A CLEVELAND No. 9-1 INCLINABLE FLYWHEEL TYPE WHICH HAS A CAPACITY OF 75 TONS

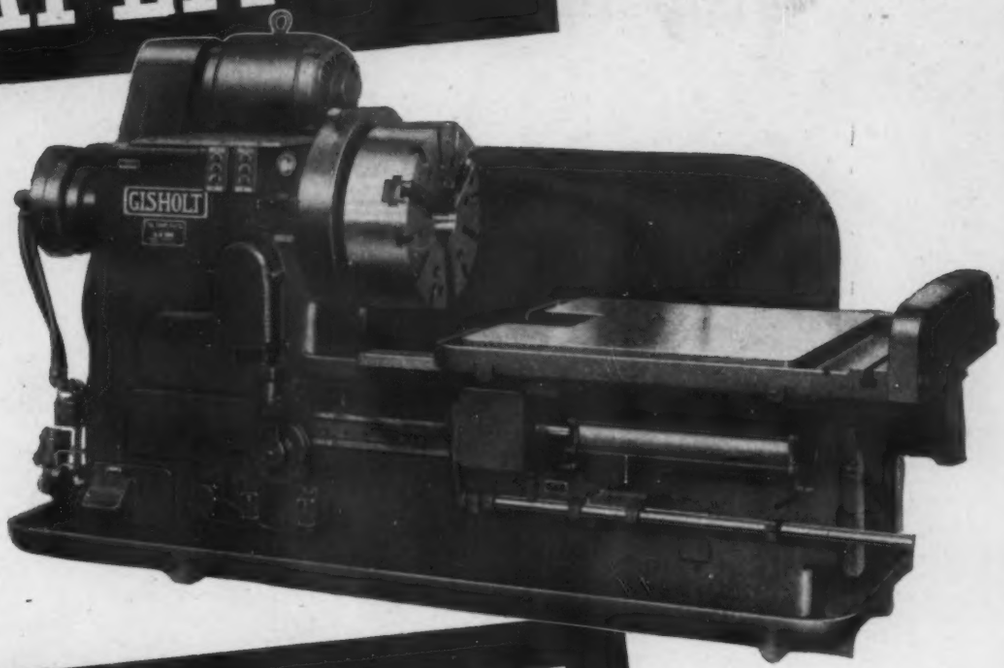
THE CLEVELAND PUNCH & SHEAR WORKS CO.

Cleveland 14, Ohio

New York · Chicago · Detroit · Philadelphia · Pittsburgh

SIMPLIFY

your "special" jobs with the GISHOLT



SIMPLIMATIC

Where you have sufficient volume for automatic machining, you, too, may find the low-cost answer in the Simplimatic.

For here's such adaptability in simple, basic design that it gives you an individualized machine to handle many diverse and unusual problems. Here are some of the reasons:

1. *A wide variety of slide positions is possible on the large platen table for straight and angular feeds.*
2. *Tailstock, hand or pneumatically operated, can be mounted on platen table for between-centers work.*
3. *Linkage arrangement between slides permits spherical boring in conjunction with facing and turning.*
4. *Back facing or back boring through the spindle can often be combined with other cuts in a single operation.*
5. *Vertical head can be used where it provides more favorable working position, with slides cammed individually or entire head cammed as a unit.*
6. *Simultaneous double end machining is possible with full utilization of the base machine.*

Now, with higher costs for labor and materials, investigate the economies the Simplimatic can bring you. Get the facts.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts.*

GISHOLT MACHINE COMPANY

Madison 3 • Wisconsin

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SUPERFINISHERS • SPECIAL MACHINES

The Hardest Possible Metal Sawing

. . . cutting off test specimens in the Metallurgical Laboratory of this giant steel plant. There is no time for pampering here. Each saw must handle anything that comes, as it comes—the hardest steels and toughest alloys, in all degrees of hardness—in any size, any form or condition—because each heat, each drawing, and each forming run has to be tested.

The steel mill where these pictures were taken reports that these saws have been operating 24 hours, 7 days a week for the last five years. Maintenance cost has been practically non-existent. Furthermore, the efficiency of these saws has made possible the elimination of an equal number of other sawing machines in the department.

The answer to your cut-off problem, whether large or small, will be found in our new C48 catalog. The services of our field engineers are also available in every locality. *Send for either or both now.*

ARMSTRONG-BLUM MFG. CO.

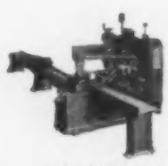
"The Hack Saw People"

5700 BLOOMINGDALE AVE. CHICAGO 39, U. S. A.

No. 1, No. 2 Series *Capacity: 4"x4" Capacity: 6"x6"*

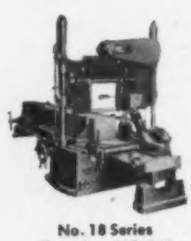
No. 4B Series *Capacity: 6"x6"*

No. 6 Series *Capacity: 6"x6"*

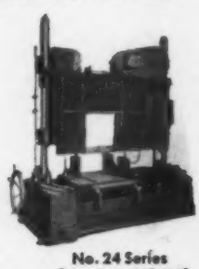


No. 9A Series *Capacity: 10"x10"*

No. 8 Series *Capacity: 18"x18"*



No. 18 Series *Capacity: 18"x18"*



No. 24 Series *Capacity: 24"x24"*

The A-B-C of Flexible-Shaft Finishing—*as seen at Chicago*

A new conception of flexible-shaft finishing *and the P&W engineering behind it* was gained by hundreds of visitors at the big P&W Booth at the Machine-Tool Show. They saw P&W Kellerflex Machines using P&W Carbide Burs, cutting everything from cast iron to hardened dies. They saw new versatility in the ever-broadening line of Kellerflex accessories . . . always in step with industry's needs.

They took with them the three booklets illustrated . . . A — the Kellerflex Machine and Attachment Catalog; B — the "Bur-ology" Booklet which provides the basis of modern finishing practice; C — The Keller Bur and Accessories Catalog. If you missed them at the Show, write today for the A-B-C of flexible-shaft finishing — any or all three of the booklets. We'll be glad to get them on their way to you immediately.

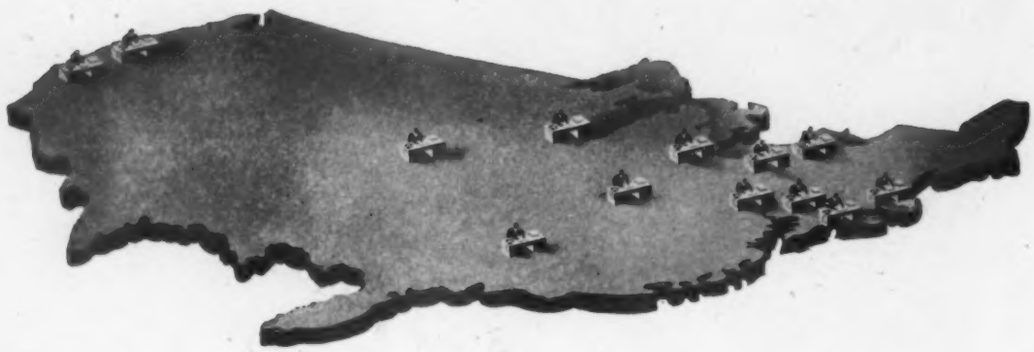
PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

A BUYING GUIDE FOR ABRASIVES

POINT No. 11

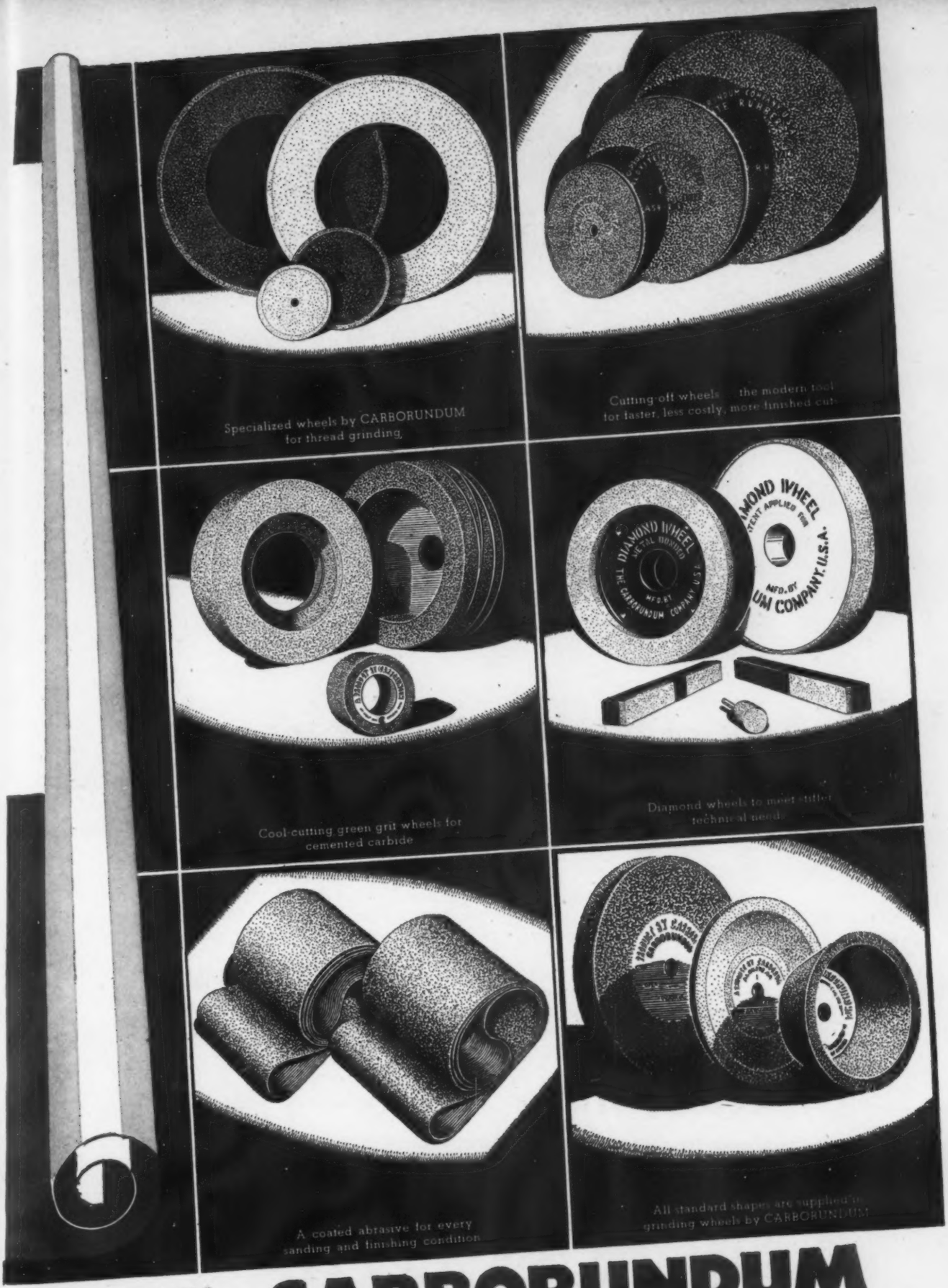


District Representation

Certain buyers of abrasives find the measure of their sources of supply in the local representatives of abrasive manufacturers. Therefore, it is a matter of great satisfaction to us to have men of ingenuity and experience representing us in key locations throughout the country. It is by means of our district organization that users are given direct access to the engineering, research, and wide scale technical activities of The Carborundum Company. It is their intelligent handling of abrasive problems, and their sincerity in serving customers' needs that makes every user think first of CARBORUNDUM, when they think of abrasives. The Carborundum Company, Niagara Falls, New York.

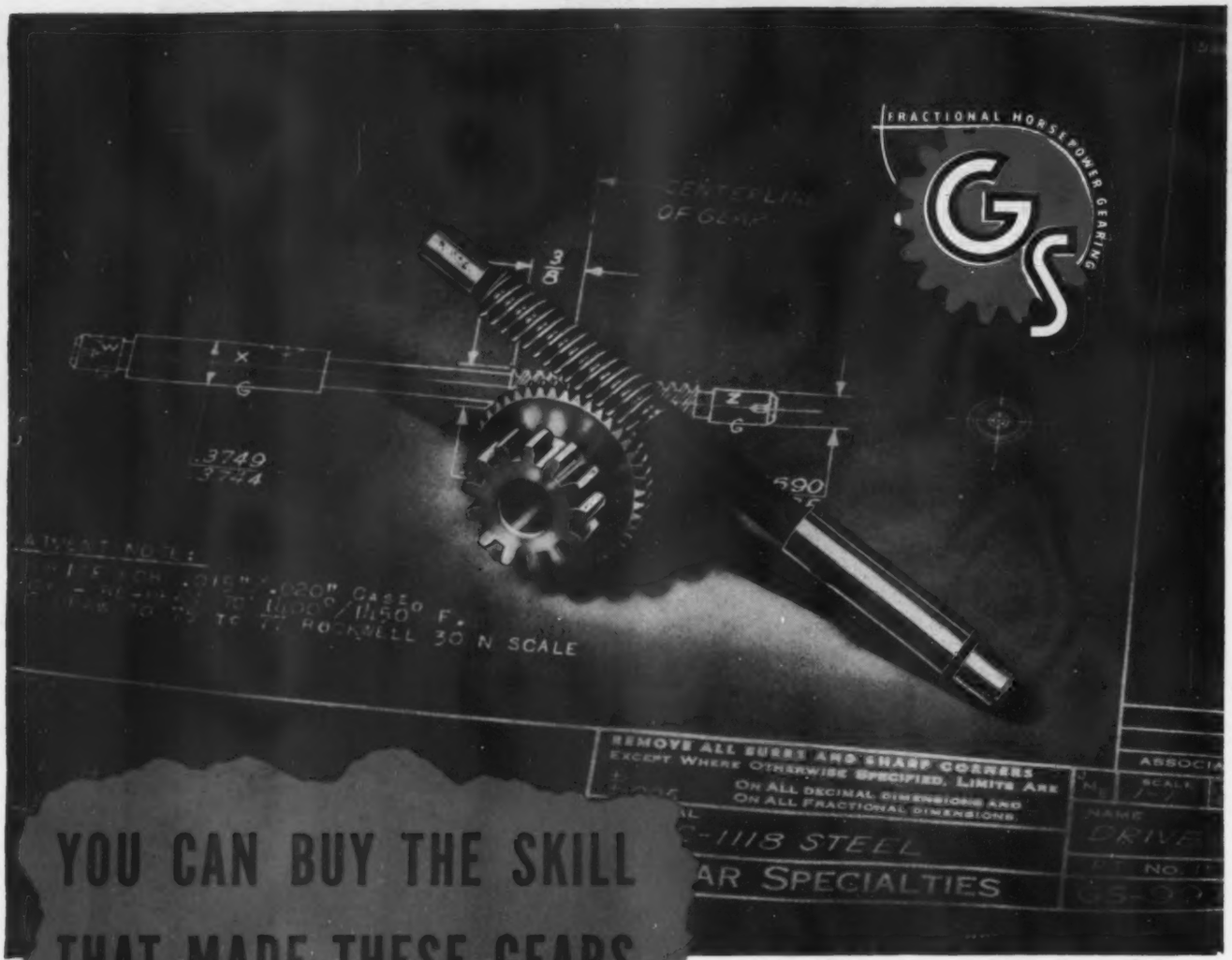
CARBORUNDUM

A Good Rule for Good Grinding


Specialized wheels by CARBORUNDUM for thread grinding.
Cutting-off wheels . . . the modern tool for faster, less costly, more finished cut.
Cool-cutting green grit wheels for cemented carbide
DIAMOND WHEEL
METAL BONDED
MFD. BY
THE CARBORUNDUM COMPANY, U.S.A.
Diamond wheels to meet every technical need.
A coated abrasive for every sanding and finishing condition
All standard shapes are supplied in grinding wheels by CARBORUNDUM

. . . CALL IN **CARBORUNDUM** TRADE MARK

● BONDED ABRASIVES ● COATED ABRASIVES ● ABRASIVE GRAINS AND COMPOUNDS



YOU CAN BUY THE SKILL THAT MADE THESE GEARS

The same skill with which we fabricate Small Gears for so many of America's most particular users, is also available for *you*. Get started now depending upon this one BIG source for all of the Small Gears you need. Here, you'll enjoy the advantage of all the large, highly specialized facilities developed thru a quarter century of concentrating on the manufacture of finer Small Gears exclusively.

If you need production runs of Fractional Horsepower Gears that perform more smoothly and accurately, that measure up to highest *uniform* standards of quality and precision, by all means discuss your requirements with a G.S. Engineer! Possibly he may suggest a better design, a more practical material, a method of production that will result in better gears, at moderate cost. Will you write or telephone us *today*?

SEND FOR OUR CATALOG BULLETIN

GEAR Specialties

Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

2635 WEST MEDILL AVENUE • CHICAGO 47, ILLINOIS

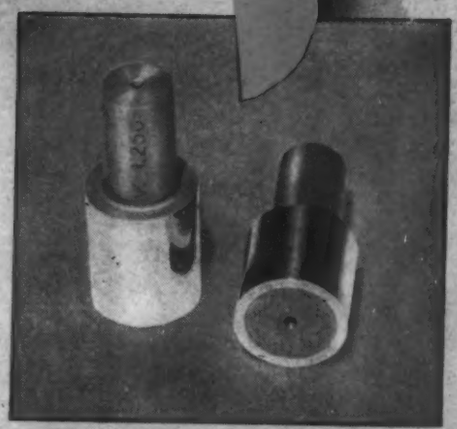
MEMBER OF AGMA

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

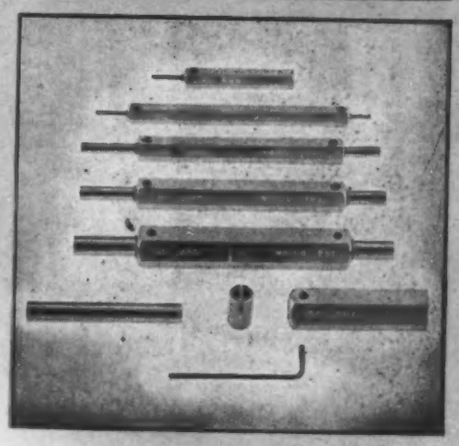
Van Keuren

PRECISION CHROMIUM PLATING applied to Plug Gages

THE Van Keuren Co. has developed a new method of precision chromium plating of wire type and taper insert plug gages. In this modern plant we have combined the best available plating practice with the ability to make precision measurements. We are able to deposit a chromium wear surface accurate to a few millionths of an inch. Gages are finished to the low wear limit and then are plated to the high wear limit. The result is a thin, closely adhering wear surface which will not crack or peel and which is available at a very moderate cost.



Instead of paying 50 to 75% additional for chromium-plated gages, they are now available for only 25% additional and they wear 3 to 5 times as long as steel gages. The many repeat orders which we are getting from large users indicate that this new method is resulting in more prompt deliveries, greater wear, lower gage cost, and satisfied customers. For your next gaging job, specify Van Keuren chrome-plated gages.



Handbook and Catalog No. 33.

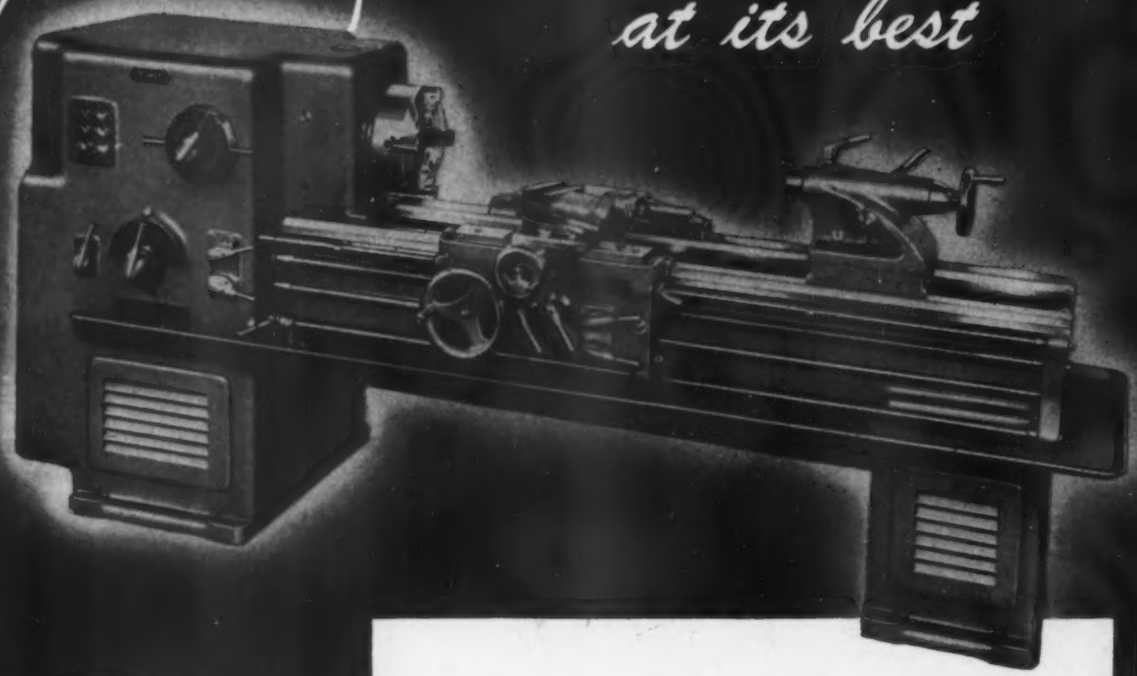
THE Van Keuren CO.,

28th YEAR

176 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires.

QUALITY
at its best

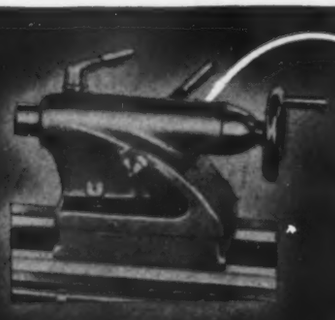


Sidney Lathes

When you consider the many construction features offered in Sidney Lathes, you can readily understand why it has ample power to produce accurate work over long periods. For example, the double wall bed of semi-steel, nickel mixture—the 32 speed continuous tooth herringbone geared head—the totally enclosed quick change gear box providing sixty thread and feed changes—the double wall apron—and centralization of controls for ease of operation. These and many other features contribute to the fact that the Sidney Lathe is the outstanding machine in its field.

Bulletins on all sizes available.

Builders of Precision Machinery
THE SIDNEY MACHINE TOOL COMPANY
SIDNEY • OHIO
ESTABLISHED 1904



MANY EXCLUSIVE FEATURES FROM HEAD TO TAIL

Production gaging with External Comparator No. 951 and Amplifier No. 950.

NEW! Electronic

● EXTERNAL ● INTERNAL

Precision gaging on a mass-production scale is now both practical and economical for any plant or laboratory! The new Brown & Sharpe Electronic Measuring Equipment applies electronic super-sensitivity to measurement, and electronically amplifies the results for instant, accurate reading on a large calibrated dial. It enables accurate gaging to .00001", as fast as test-pieces can be handled.

An outstanding advantage of this new Electronic Measuring Equipment is the separate amplifier unit, which isolates heat-producing elements and prevents temperature drift in gaging units. Another unique feature is the true linear response of the gaging units, which permits accurate setting for the entire scale with only one gage block or master. These are only two of *many* advantages.

Get the full story of this versatile new Electronic Measuring Equipment. Write for details. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

We urge buying through the Distributor

Speedy internal gaging with Internal Comparator Attachment No. 952, Amplifier No. 950 and Signal Light Attachment No. 958 (optional).

Gage Head Cartridge No. 953 is shown mounted in special fixture for linear gaging.

BROWN & SHARPE

Introduced at Chicago . . .

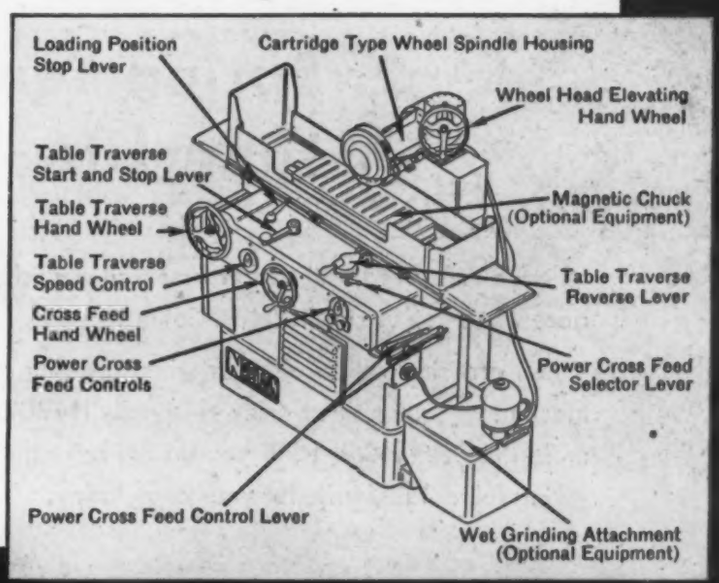
Catalogs on request of all new Norton machines shown at Chicago—no obligation

The *new* NORTON 8" × 24" *hydraulic* SURFACE GRINDER

THIS new Norton surface grinder combines the qualities required for both the tool room and the production line. It is highly adaptable to frequent changes in set up — the condition encountered in the tool room. It has the ruggedness to deliver "all out"— as is demanded by the production line.

DESIGN HIGHLIGHTS—Horizontal and vertical ways protected from dust and grit. ★ Saddle well proportioned to give smooth cross feed throughout its full range of travel. Saddle ways and table ways pressure lubricated. ★ Work table operated by hand or hydraulic power with table speeds up to 70 feet per minute in hydraulic power. ★ Grinding wheel spindle of the cartridge type, motor driven by flat belt; positive end thrust built into the spindle. ★ Hydraulic system is low pressure type with pump and all connections in the base so that any seepage drains back into the reservoir.

Note the simplicity of controls and adjustments, and their location for the utmost convenience of the operator.


Loading Position Stop Lever
Cartridge Type Wheel Spindle Housing
Wheel Head Elevating Hand Wheel
Table Traverse Start and Stop Lever
Magnetic Chuck (Optional Equipment)
Table Traverse Hand Wheel
Table Traverse Speed Control
Table Traverse Reverse Lever
Cross Feed Hand Wheel
Power Cross Feed Controls
Power Cross Feed Selector Lever
Power Cross Feed Control Lever
Wet Grinding Attachment (Optional Equipment)

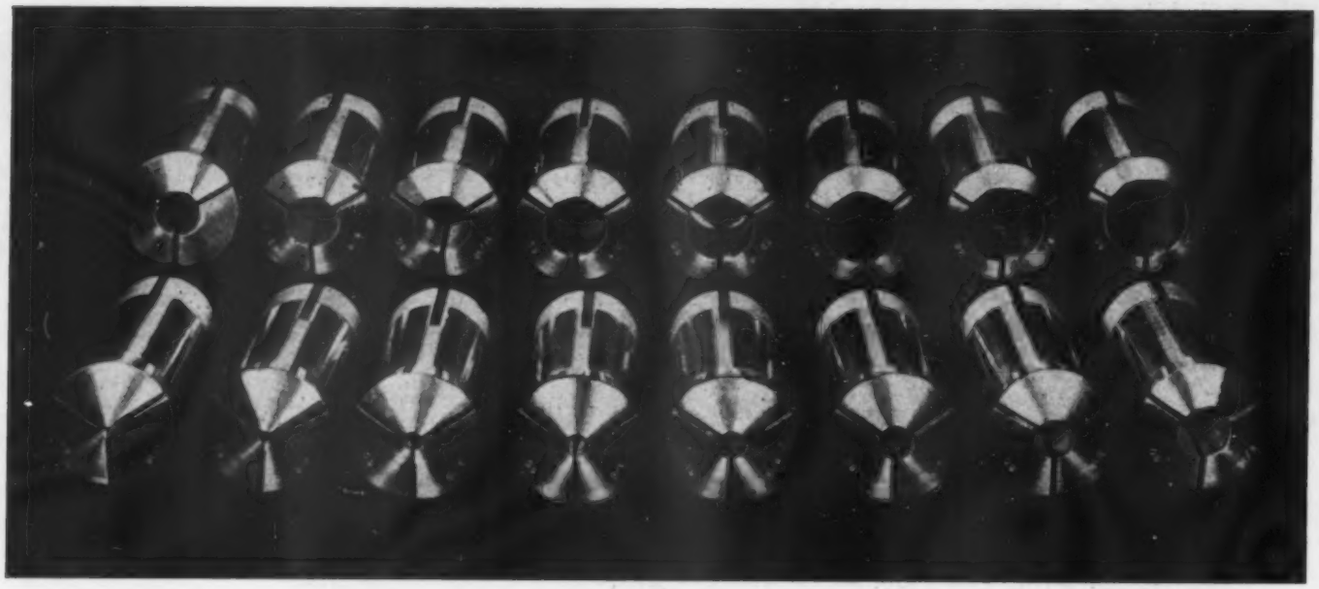
NORTON COMPANY
WORCESTER 6, MASS.
Distributors in All Principal Cities
M-554

NORTON GRINDERS *and Lappers*

USE HARDINGE COLLETS

HARDINGE
ELMIRA, N.Y.

and get all 3*



* 1. Accuracy
2. Spring Temper
3. Long Life

You are assured of the three essential requisites for proper collet performance when you use HARDINGE Collets.

When ordering collets only, or when ordering collets with lathes or milling machines of any make or size — specify HARDINGE Collets . . . they cost no more than other Collets. If you do not have the HARDINGE Bulletin No. 47 giving full details, write for your copy today.

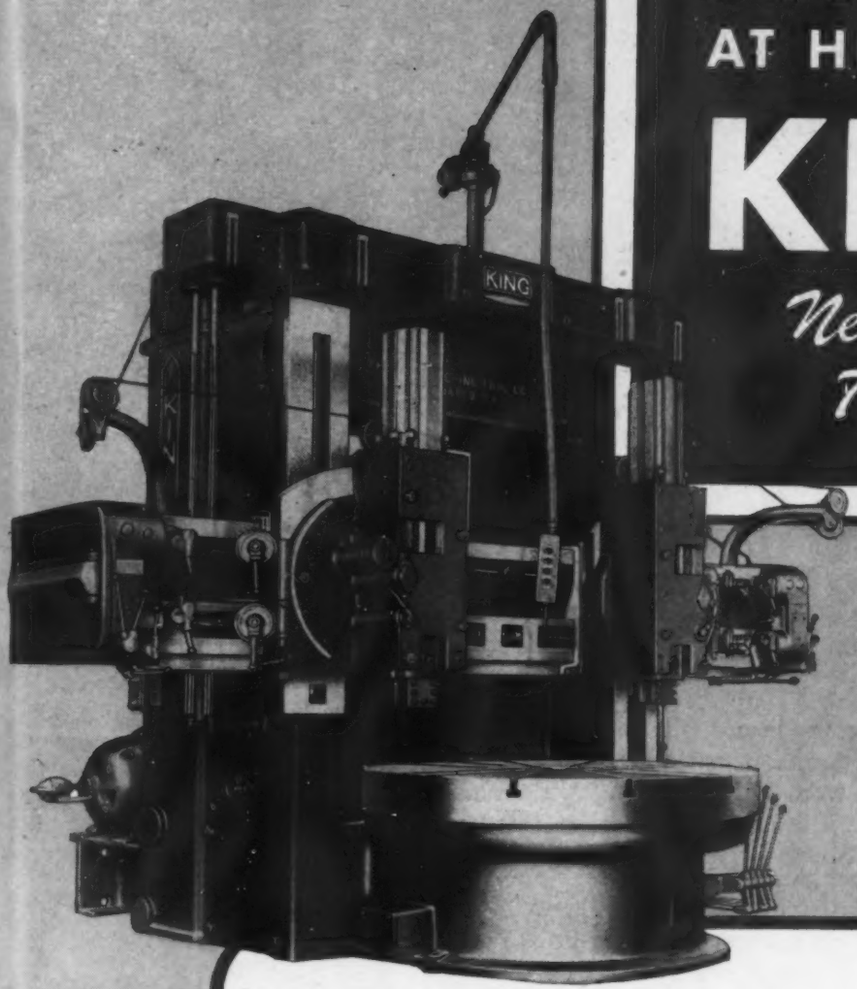
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

PRECISION AT HIGH SPEED

KING

New Series
72 inch



● One of the basic reasons for the extremely accurate production from this new series KING stems from its substantially increased weight and rigidity.

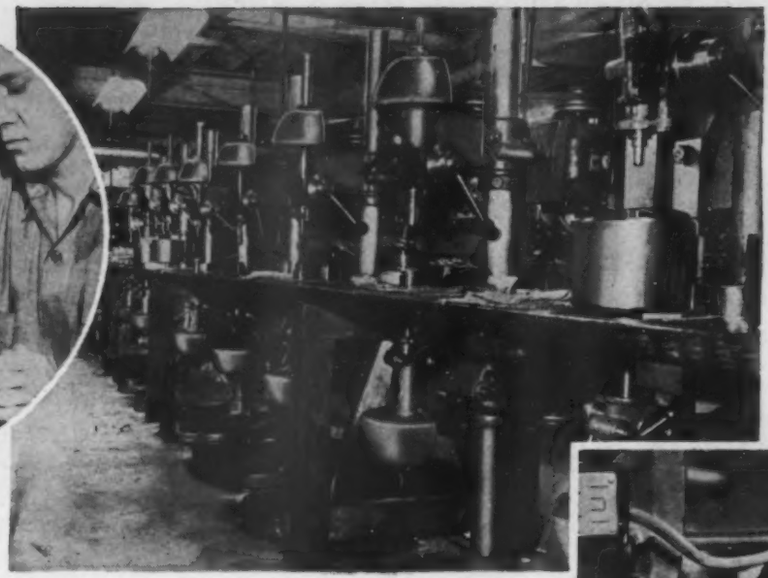
For example this increased weight and new, massive rectangular type ram heads give you ample rigidity to use carbide tools to their limit. This construction plus the increased speed range provides both accuracy and flexibiilty of operation. All of which boils down to lower costs and higher production.

The New Series KING is available in the following sizes—30", 36", 42", 52", 62", 72", 84", 100", 120" and 144". Write for complete details.

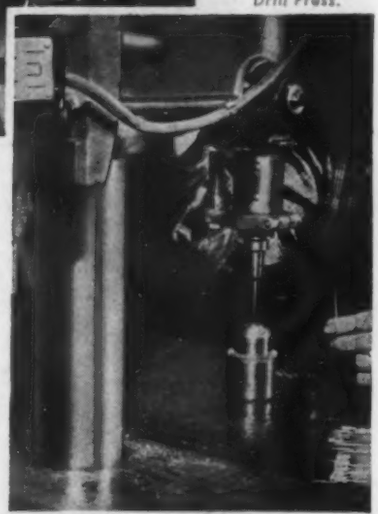
THE KING MACHINE TOOL COMPANY
CINCINNATI 29, OHIO

Builders of Vertical Boring and Turning Machines Exclusively

Turning with 15" Walker-Turner Drill Press.



A battery of twelve threading machines made up with two Walker-Turner drill heads on each column. Produce class #3 threads at very fast production.



Tapping with 15" Walker-Turner Drill Press.

"We Make Screw Machine Parts . . . . . with 30% Production Increase"

CHARLES MARTI

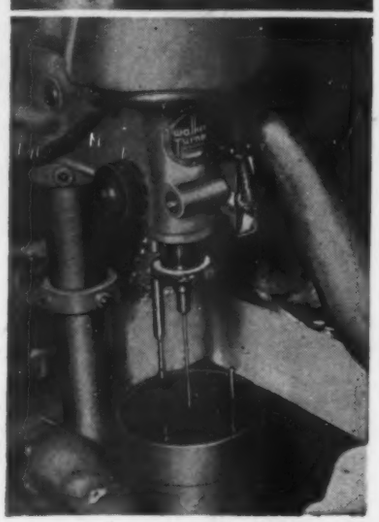
Charles Marti, manufacturer of precision screw machine products, has combined screw machine techniques with Walker-Turner 15" Drill Presses with remarkable results.

"We have 58 Walker-Turner Drill Presses in our plant, all used in the manufacture of small screw machine parts ordinarily made on Swiss Automatics. These parts range in size from 1/32" to 3/8" in diameter, 3/4" to 5" long and are held within .002 limits.

"Each machine performs a single operation. All machines are equipped with special turning fixtures which are adjustable to any size; twelve installations have two heads mounted on each column and do the work of threading machines. All tools and bushings are submerged in oil.

"With this method, we showed a 30% increase in production in the manufacture of needles for lettering pens as compared with the former screw machine method. All work is done by unskilled operators.

"We intend to continue using this method because it assures flexibility of operation, and is particularly economical in making short runs. New jobs do not require sets of cams, only resetting of tools."



Threading with Walker-Turner Drill Press.

CHARLES MARTI, *President*
Charles Marti Precision Screw Machine Products
Newark, N. J.

TWENTY-FIFTH YEAR
1922 1947

walker-turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

SOLD ONLY BY AUTHORIZED INDUSTRIAL MACHINERY DISTRIBUTORS 161

MACHINE TOOLS

DRILL PRESSES—HAND AND POWER FEED • RADIAL DRILLS • RADIAL SAWS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

SIMONDS Red Tang FILES

... they keep your File-Costs down

RED TANG FILES have the same basic tooth-design as Simonds Metal-Cutting Saws. So Red Tangs *cut*, instead of *scrape* . . . remove more metal with less elbow-grease. That's why workers like them. *And here's why YOU will like them:* They last longer . . . and deliver more and better work per file-dollar. Order Simonds Red Tang Files from your Industrial Supply Distributor, or from the nearest Simonds office listed below.

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS.

Other Divisions of SIMONDS SAW AND STEEL CO. making Quality Products for Industry

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SIMONDS ABRASIVE CO. — Grinding Wheels and Grains

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BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W First Avenue, Portland 4, Ore; 31 W. Trent Avenue, Spokane 8, Washington; *Canadian Factory:* 595 St. Remi St., Montreal 30, Que.

PRODUCTION NEWS!
a new era in shaft-turning
The new BULLARD MAN-AU-TROL HORIZONTAL LATHE
Model 30H produces three identical parts at once...
with interchangeable manual or automatic control!
BULLARD
MAN-AU-TROL
MASTER OF THE MACHINE
HORIZONTAL LATHE
Model 30H
BULLARD CREATES NEW METHODS

On shaft-turning, grooving, facing, angle-turning or between-center chucking jobs, you can multiply your present output with the new BULLARD Man-Au-Trol 3-Spindle Horizontal Lathe—and reduce costs proportionately.

But that's only part of the economy-story. You'll find this latest BULLARD machine a radical departure from conventional design, with many improvements contributing to better workmanship and further savings in time and money.

NO OTHER SHAFT-TURNING LATHE OFFERS ALL THESE ADVANTAGES

All 3 spindles are equipped with hydraulic, centering-type, lever-gripping chucks. These chucks function two ways: a center extends to pick up the work, which is then gripped by two hydraulically operated levers, eliminating the use of driving dogs.

Man-Au-Trol control, head stock and all other machine-operating controls are located at operator's right.

Each hydraulic chuck is operated by an individual foot-treadle, allowing operator unrestricted use of both hands.

Both saddle and tool slide travel on vertical bearing ways, entirely free of the chip area.

An automatic feed interrupter breaks the chips to desired lengths for easy removal from the chip receiver.

Vertical construction of saddle and saddle ways allows chips to fall freely into receiver without accumulating around operating parts.

Work and tools are always visible and easily accessible to the operator without reaching across tool slide and tools.

Massive weight and firm application of all components provide extreme rigidity, assuring minimum vibration and maintained accuracy.

PLUS THE ADVANTAGES OF BULLARD MAN-AU-TROL

Man-Au-Trol has given complete proof on other BULLARD lathes of its amazing ability to lower costs by upping productivity, versatility and accuracy. When in manual operation for shorter runs, functions are performed faster than with most types of manually operated lathes. On longer runs of ten or more pieces it enables quick conversion to 100% automatic operation. Controlling the head through ***39 separate functions in any sequence,*** it enables the machine to cut practically continuously. With the lathe set for fixed maximum production, there are no stops for customary manual operations, no loss of time due to the human element, and output is stepped up 4 ways:

1. ***Lightens Labor's Load*** because the operator machines the first piece under manual control while easily setting the operations for automatic cycle . . . then merely loads, supervises and unloads when Man-Au-Trol's 100% automaticity takes over.

2. ***Makes One Machine Do More*** because it automatically machines any class of work within manual-control range . . . is instantly convertible to manual operation on the same or a different piece without affecting the automatic cycle.

3. ***Cuts Automatic Set-Up Time*** because set-up time from one class of work to another is only slightly more than for a manually operated machine.

4. ***Reduces Spoilage*** because it operates continuously to a degree of accuracy manual operation cannot duplicate.

So, while retaining the versatility of manual control for short runs, this new BULLARD Man-Au-Trol machine can be quickly changed to fully automatic operation on production of 3 identical parts at once — substantially lowering manufacturing costs. Why not find out how this revolutionary, cost-saving combination can benefit your own production? Engineering data and other facts on the new BULLARD Man-Au-Trol 3-Spindle Horizontal Lathe gladly sent on request. THE BULLARD COMPANY, Bridgeport 2, Connecticut.

TO MAKE MACHINES DO MORE

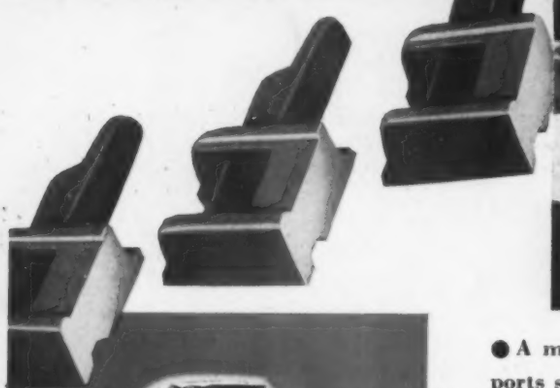
Job Engineered CUTTERS

PROVIDE IMPROVED MACHINING METHODS

★ TOOL LIFE DOUBLED

★ PRODUCTION INCREASED 5 TIMES

★ COSTS REDUCED TO A FRACTION



● A methods study of the milling operation on these cast iron yarn supports showed that it was difficult to clamp pieces satisfactorily because of their small size, and that tool cost was excessive because the standard slotting cutters used became undersized after only a few sharpenings.

A change in method was proposed and the problem of tool life was referred to Barber-Colman Cutter Engineers. Interlocking side mills were recommended for the job. Tooth design of these job-engineered cutters provided easier, smoother cutting action. The interlocking feature made it easy to hold sharp corners and close tolerances on width. Climb cutting in combination with a magnetic chuck exerted downward pressure on the parts, sufficient to hold them firmly in place without mechanical clamping.

This application is typical of many small job lot operations which have been improved through the application of Barber-Colman job-engineered cutters. Write Barber-Colman Engineering Service for recommendations on your cutter problems.

PRODUCTION RECORD

Material—Cast-Iron, frequent hard spots

Operation—Milling slots .067" x .657" x 1", 23 pieces per load held on magnetic chuck.

Cutters—B-C Interlocking Side Mills, 3" x .675" x 1¼".

Tool Life—3300 pieces per sharpening (formerly 1700 pieces).

Feed—14" per minute.

Speed—250 SFM, or 318 RPM.

Cutting Time—500 per hour (former time, 100 per hour).

ASK for a copy of Milling Cutter Data, describing examples of economical milling on a variety of parts. A request on your company letterhead will bring you a copy promptly.

MODERN MACHINES WITH ORDINARY CUTTING TOOLS ARE NOT FULLY EFFICIENT

BARBER B-C COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT 111 LOOMIS ST. ROCKFORD, ILLINOIS U.S.A.

a reminder

to those who build, buy, or use Electrical Equipment

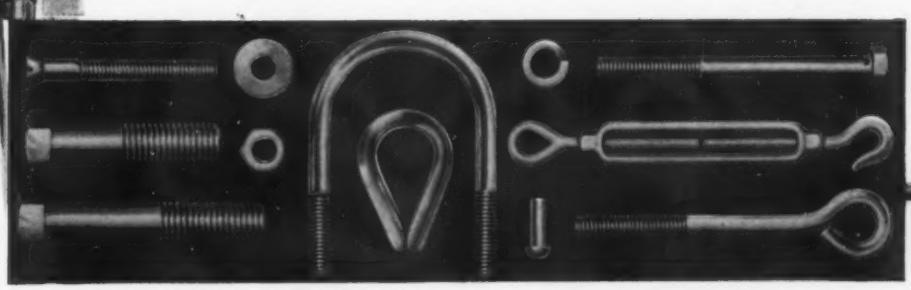
IN general, electrical equipment represents a substantial investment. To guard against costly service interruptions, the many items of poleline hardware, connectors and similar accessories should possess the utmost in dependability. These accessories, while representing a very small part of the total cost, must withstand a relatively large part of the operating burden.

The American Brass Company has developed a number of copper alloys that have proved outstandingly successful in providing the strength and toughness required to withstand gale and storm conditions and ever-changing temperatures... and to resist the corrosive action of industrial gases and vapors, saline seaboard fogs and humid gulf coast atmospheres. Some typical applications of these Anaconda Metals appear on the following page.

47119

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*



Millions of Everdur* bolts, connectors, and similar accessories are now in daily service, reducing replacement costs and failure of structural members.

*Reg. U.S. Pat. Off.

ANACONDA
from mine to consumer

Anaconda Copper & Copper Alloys

Products serve better... last longer

when the right metal goes into the right place

Here are two examples, both supplied through the courtesy of the Reliable Electric Company, Chicago.

Each of the metals used was selected in the alloy which contributes a *combination* of the most desirable properties. The metals for the component parts meet all requirements for workability and machinability... while the assembled units provide the necessary high strength, vibration and corrosion resistance, and high electrical conductivity.

Next time you get to the stage of "specifying metals" call on us. Our Technical Department will be glad to work with you.

THE AMERICAN BRASS COMPANY
General Offices: Waterbury 88, Connecticut

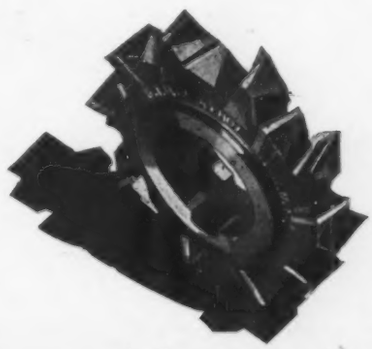
COPPER DIE PRESSED FORGED BODY
HIGH STRENGTH COMMERCIAL BRONZE 216
EVERDUR* 1015 PRESSURE BAR
COPPER CONTACT
HITENSO* BB-961 (CADMIUM BRONZE) BOLT
EVERDUR* 1015 EYE BOLT
"RELIABLE" HOT LINE CLAMP ASSEMBLY

ANACONDA
from mine to consumer

Anaconda
COPPER and COPPER ALLOYS

UNION
MILLING CUTTERS

Our thorough knowledge of tooth design, of the cutting properties of tool steels, and of the machining characteristics of modern materials enables us to build Union Milling Cutters exactly fitted to your needs. Try them on your toughest "tool killing" job, and let performance prove Union economy, efficiency, accuracy and service.



UNION TWIST DRILL COMPANY, ATHOL, MASS.

S. W. Card Mfg. Co. Division, Mansfield, Mass.
Butterfield Division, Derby Line, Vt. and Rock Island, Que.

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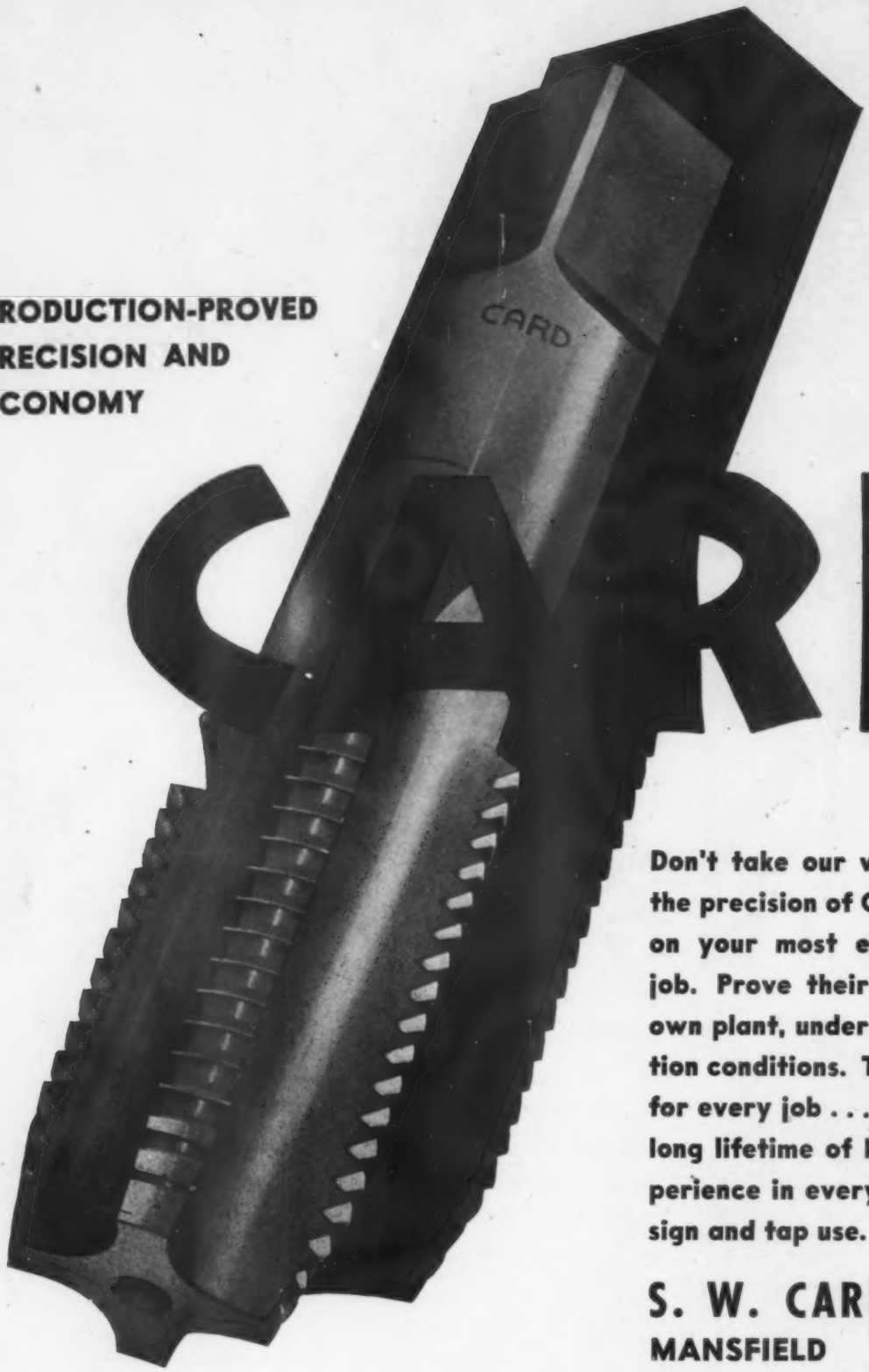
SEATTLE: 568 First Ave., So.

PRODUCTION-PROVED PRECISION AND ECONOMY



CARD

Don't take our word for it. Prove the precision of Card Taps yourself on your most exacting threading job. Prove their economy in your own plant, under your own production conditions. There's a Card Tap for every job . . . each backed by a long lifetime of knowledge and experience in every phase of tap design and tap use.

S. W. CARD MFG. CO.

MANSFIELD MASS.

Division of the Union Twist Drill Company

Stores: NEW YORK: 61 Reade Street—CHICAGO: 11 South Clinton Street—DETROIT: 5527 Woodward Avenue—LOS ANGELES: 524 East Fourth Street—SEATTLE: 568 First Avenue, South.

UNION ★ BUTTERFIELD ★ CARD

REAME[illegible]Y

Butterfield

When you want the "one best" reamer for the job . . . choose Butterfields. Whatever the work, the material, the output required, the tolerances, you can choose Butterfields and be sure of results that are right — in performance, in precision, and in price.

BUTTERFIELD DIVISION

Derby Line, Vt. **Rock Island, Que.**

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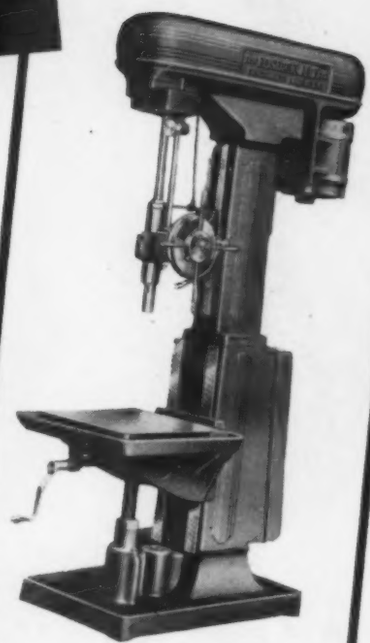
Divisions of the Union Twist Drill Company

Fosdick Presents
2 NEW SENSITIVE DRILLS

SINGLE PURPOSE SENSITIVE

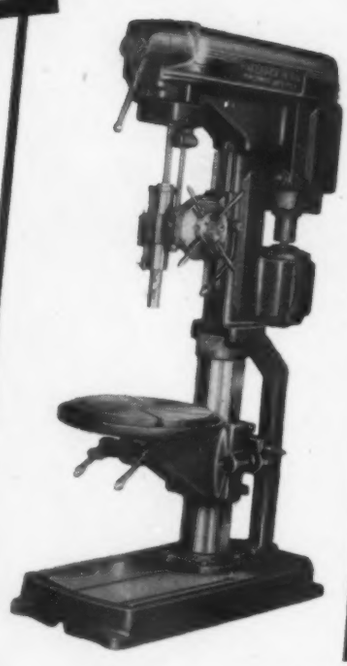


● To meet the demand for a strictly production machine, Fosdick has added this single purpose machine to their line of sensitive drills. It has but one feed and one speed. Proper feeds and speeds are determined for the jobs to be run.

Motor is mounted on a top bracket and power is transmitted to the spindle through a series of Vee belts. Changing the sheaves provides a range of spindle speeds from 100 to 3600 RPM. Feed changes are obtained by means of pick-off gears in the feed box.

Machines are available in single and multiple types and in two sizes 1" and 1½" in cast iron.

HEAVY DUTY SENSITIVE #4 BMR



● To accommodate work requiring a sensitive drill with a heavy duty round table, Fosdick has added the #4 BMR to its line of Sensitive Drills.

The round column which supports the table arm is exceptionally large in diameter and a back brace is used to obtain additional rigidity.

The table arm and table are raised and lowered by means of a worm, worm wheel and rack.

For operations on large castings the table can be swung away from the base and the work placed directly on the finished base.

Standard features such as power feed, reversing tapping, automatic tapping control, etc., can be supplied.

Write for full descriptive bulletin Fosdick H. S. Drills H.S.A.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

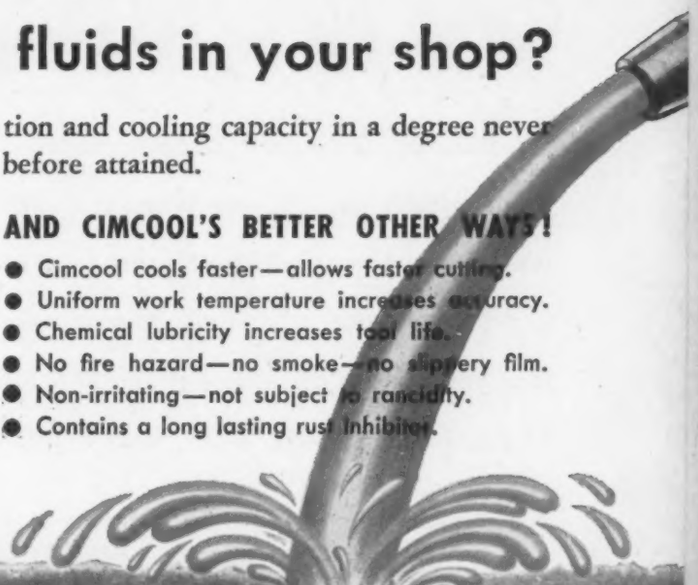
CONFUSED?

. . . by too many cutting fluids in your shop?

Then try Cimcool and watch the puzzle solve itself! This revolutionary *new kind* of cutting fluid replaces all water emulsions and all but a few highly compounded specialty oils—actually covers 85 per cent of all metal working operations. That's because Cimcool is a *chemical emulsion* incorporating an entirely new principle in cutting fluids—combining friction reduction and cooling capacity in a degree never before attained.

AND CIMCOOL'S BETTER OTHER WAYS!

- Cimcool cools faster—allows faster cutting.
- Uniform work temperature increases accuracy.
- Chemical lubricity increases tool life.
- No fire hazard—no smoke—no slippery film.
- Non-irritating—not subject to rancidity.
- Contains a long lasting rust inhibitor.



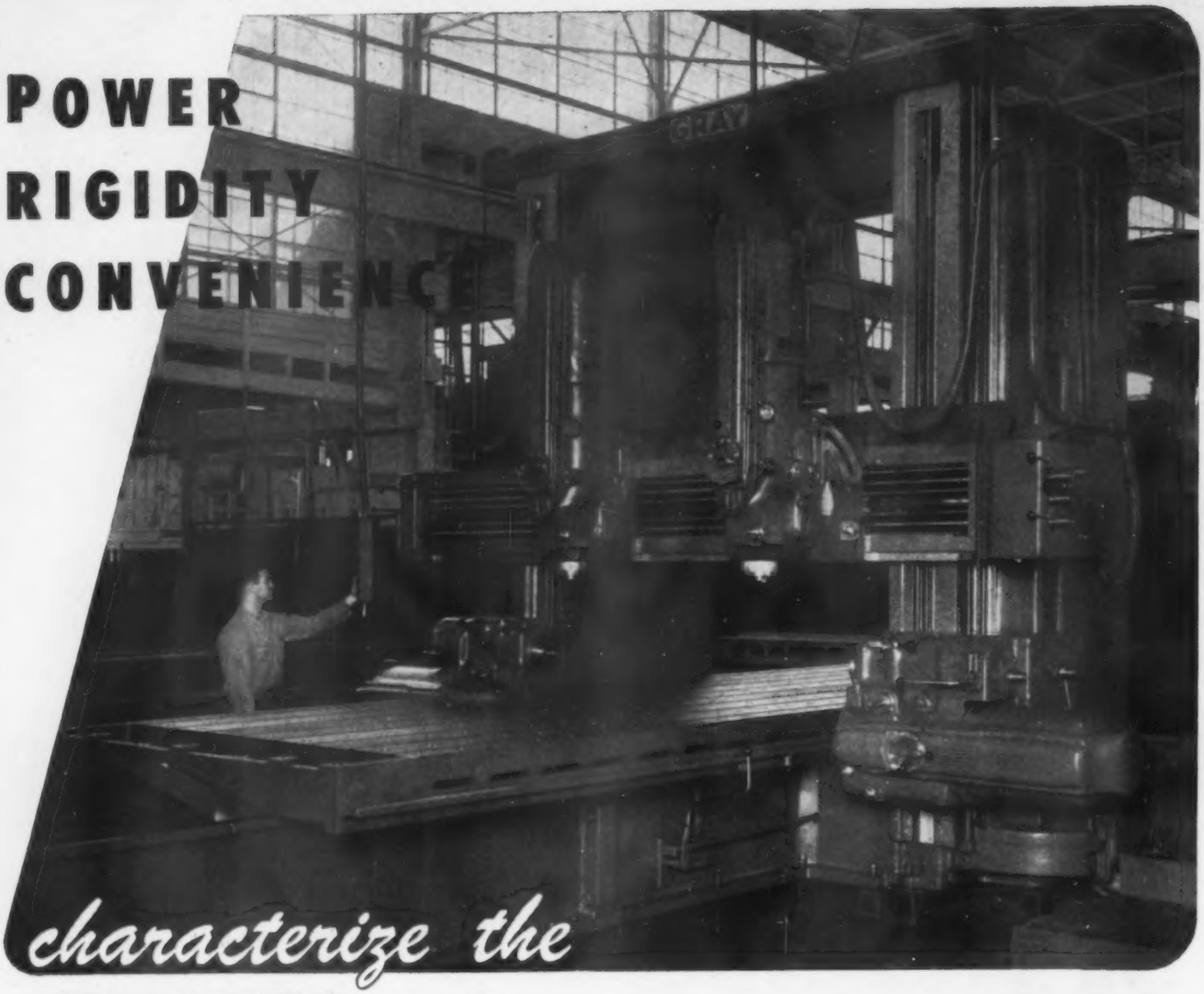
CIMCOOL

THE MULTI-PURPOSE CUTTING FLUID

Trade Mark Reg. U. S. Pat. Off.

CIMCOOL DIVISION of THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO, U. S. A.

POWER
RIGIDITY
CONVENIENCE



characterize the

GRAY MILLING MACHINES

YOU NEED all three qualities for maximum production. Power without Rigidity will cause poor work and short tool life. Rigidity without adequate Power means that you cannot drive modern cutting tools at maximum speeds, feeds, and depth of cut, but Power and Rigidity without Convenience will result in waste man hours and consequent inefficient operation. Therefore, we say you must have Power, Rigidity and Convenience for Maximum Production, and the Gray Milling Machine has all three.

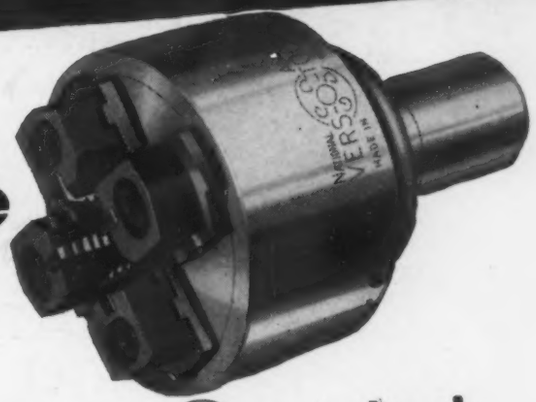
The G.A. **GRAY** *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.

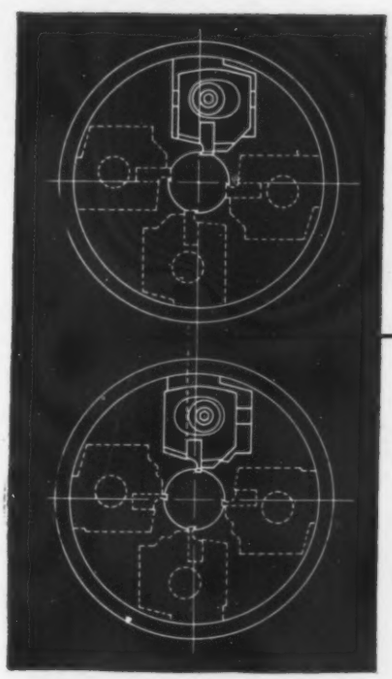
Announcing AN ENTIRELY NEW PRINCIPLE

Adjustable-blade Chasers



for standard circular chaser VERS-O-TOOL heads

HERE'S WHAT ADJUSTABLE-BLADE CHASERS WILL DO FOR YOU



1 *Cut Your Tool Costs.* Adjustable-blade chasers are inexpensive, ideal for medium and short-run jobs. Use them on the same Vers-O-Tool head that you use with circular chasers for the long-run jobs. Two sizes of blade holders and seventeen sizes of blocks cover the range of the six standard self-opening Vers-O-Tool head sizes from 3/8" to 1 5/8".

2 *Increase the Range of Work You Can Economically Handle.* Adjustable-blade chasers will thread, turn or end-form, just like circular chasers. They regrind just as accurately, and can be replaced just as fast—yet they cost less. Tool investment is low enough to permit use for all threading, no matter how short the run.

3 *Provide This Adjustment for Regrind Wear.* Regrind as often as necessary. You can keep chaser blades at top operating efficiency without fear of spoilage if the run is interrupted. The take-up adjustment of the block allows you to bring the cutting edge up to the center line after every grind.

4 *Minimize Chatter Marks.* The cutting edge is always in the proper position on the transverse axis of the work. Positive adjustment of the blade-holding block prevents improper positioning; and the tool is designed for minimum overhang—it's always up close to the work.

5 *Increase Your Machining Accuracy.* Regrinding and repositioning the blades is a simple matter, whether you use adjustable-blade or circular chasers. Both are brought back to original toolroom accuracy by a minimum grind-off—and both may be checked in the same micrometer gage, insuring precise adherence to original thread form. There's no excuse for finishing the run with dull cutters when you're using the Vers-O-Tool.

For more detailed information on adjustable-blade chasers ask for Bulletin D-47.

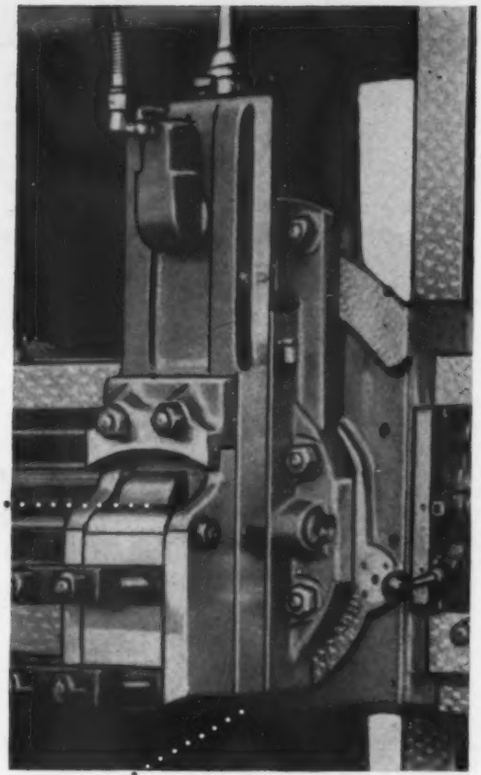
The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog-Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

Both *in the Hypro rail head*

. . . these exclusive Hypro dependable features

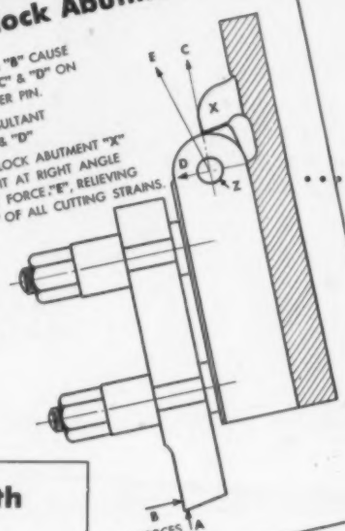


Exclusive Cincinnati Hypro Tool Block Abutment

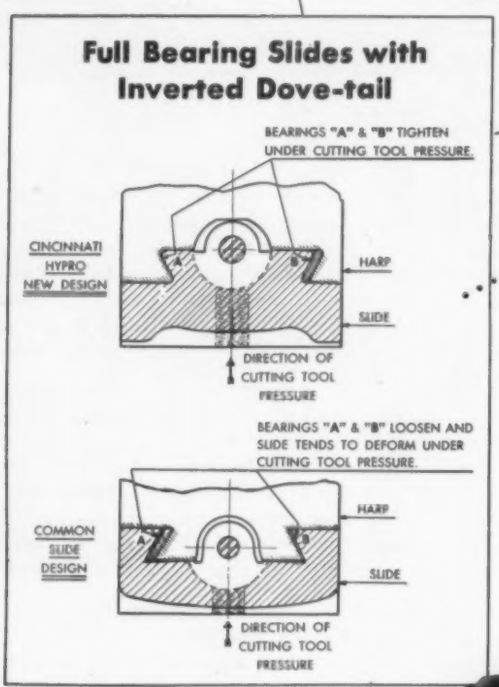
(1.) CUT FORCES "A" & "B" CAUSE ACTING FORCES "C" & "D" ON CLAPPER BOX TAPER PIN.

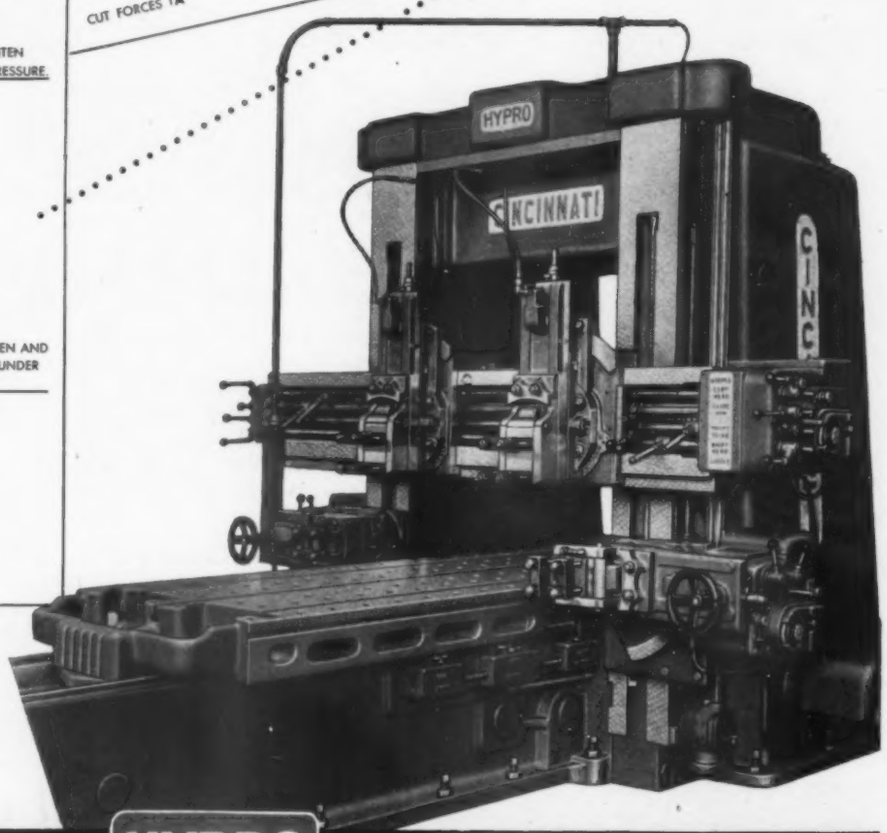
(2.) FORCE "E" IS RESULTANT OF FORCES "C" & "D"

(3.) HYPRO TOOL BLOCK ABUTMENT "X" IS PRECISION FIT AT RIGHT ANGLE TO RESULTANT FORCE "E", RELIEVING TAPER PIN "Z" OF ALL CUTTING STRAINS.



Full Bearing Slides with Inverted Dove-tail





THE CINCINNATI HYPRO PLANER COMPANY

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SCREENS

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JONES & LAMSON OPTICAL COMPARATORS

JONES & LAMSON MACHINE COMPANY
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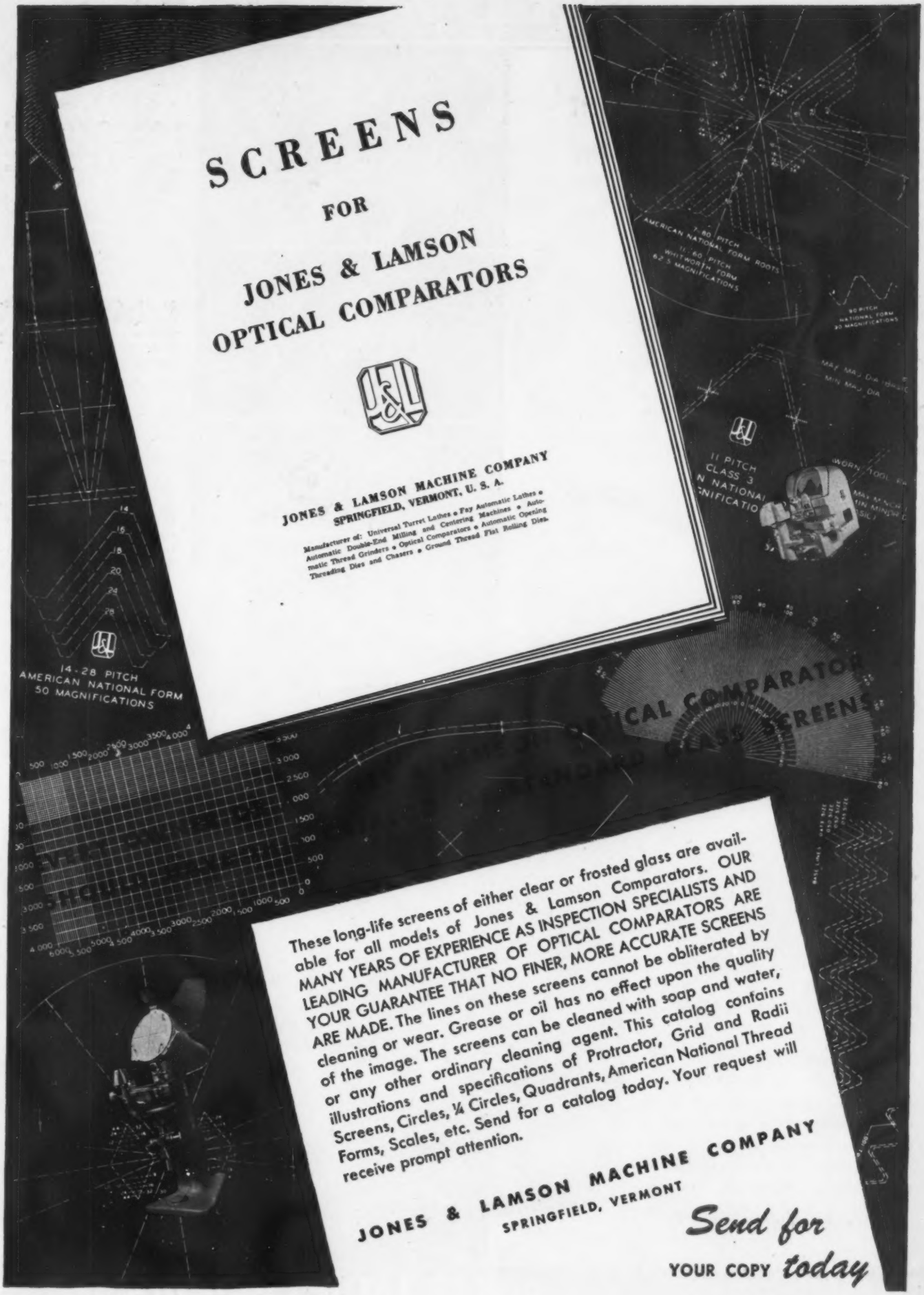

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SPRINGFIELD, VERMONT

Send for
YOUR COPY *today*

RIVETT

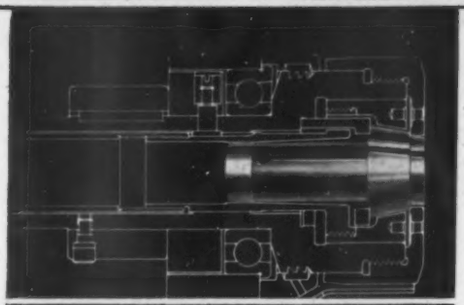
WHEN
COSTS AND QUALITY COUNT
THE *New* 918S TURRET LATHE

If you machine small and medium sized parts from bar stock or on second operations – look to this new Rivett Turret Lathe. It is designed to buy its way into your plant with cost savings and quality control.

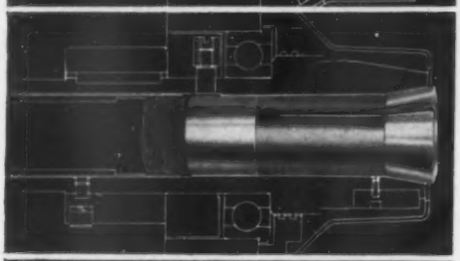
The 918S Turret Lathe cuts the initial cost of investment by taking work from larger machines. It follows by reducing the "dead time" of set-up and spoilage on every job. Then it really pays with lowered time on every piece. How? – With the right spindle speed for efficient tooling, with quick means for chucking work, with properly grouped control levers and by reducing operator fatigue.

Features designed into the 918S Turret Lathe to guard quality include a rigidly mounted precision ball bearing spindle, precise tool indexing, hardened and ground steel bedways, vibration-free drive and mounting.

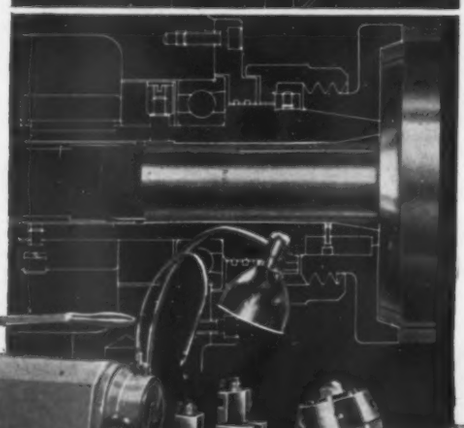
Write for Bulletin 918-ST



Stationary Collet – closes without lateral movement to maintain perfect lengths on bar stock. Maximum capacity 7/8" round.



Draw-In Collet – new design holds work truer with greater gripping power. Maximum capacity 1 1/8" round.



Step Chuck – for accurate chucking of circular or irregular parts requiring only a short grip. Maximum capacity 6" round.

RIVETT LATHE & GRINDER, Inc.

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G-E Announces

Two new instruments for saving production time and materials

Here are two new G-E quality-control instruments. Like all G-E testing and measuring equipments, they have been proved in our laboratories and on our production lines.

Good quality control means a saving in hours and dollars to you. Cutting down such waste as avoidable trimmings or excessive rejects can mean big savings to you over a year's period. For help on such individual quality-control problems, state your request in detail. Our engineers can pick from hundreds of equipments to help you with quality control. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

HAND TACHOMETER SIMPLIFIES SPEED MEASUREMENT

The new hand tachometer gives you quick accurate speed indication at low cost. You can adjust the speed of such equipments as motors, cutting lathes, and other machinery to obtain the best operating conditions. Covering an unusually wide range, it weighs only seven pounds. Machinery users and manufacturers both find this new tachometer useful. Write for Bulletin GEA-4895.

METALS COMPARATOR SEPARATES METALS QUICKLY

The new metals comparator sorts metals on basis of chemical composition and heat treatment. Useful for both magnetic and non-magnetic metals. It's portable, economical with an easy-to-read scale. Saves money in metals stockroom by identifying mixed metals. Reduces cutting tool losses by separating machinable from non-machinable metals. Permits rapid inspection—1200 to 1500 parts per hour. Write for Bulletin GEA-4894.

This new Specialized Measuring and Testing Equipment Catalog contains 44 pages of the latest developments in measuring and testing equipment, giving application, description, specifications, photographs, prices and how to order. Here, in easy-to-use form, is assembled information on approximately 100 equipments. If you can use a catalog of this type, fill out the coupon completely and send it today.

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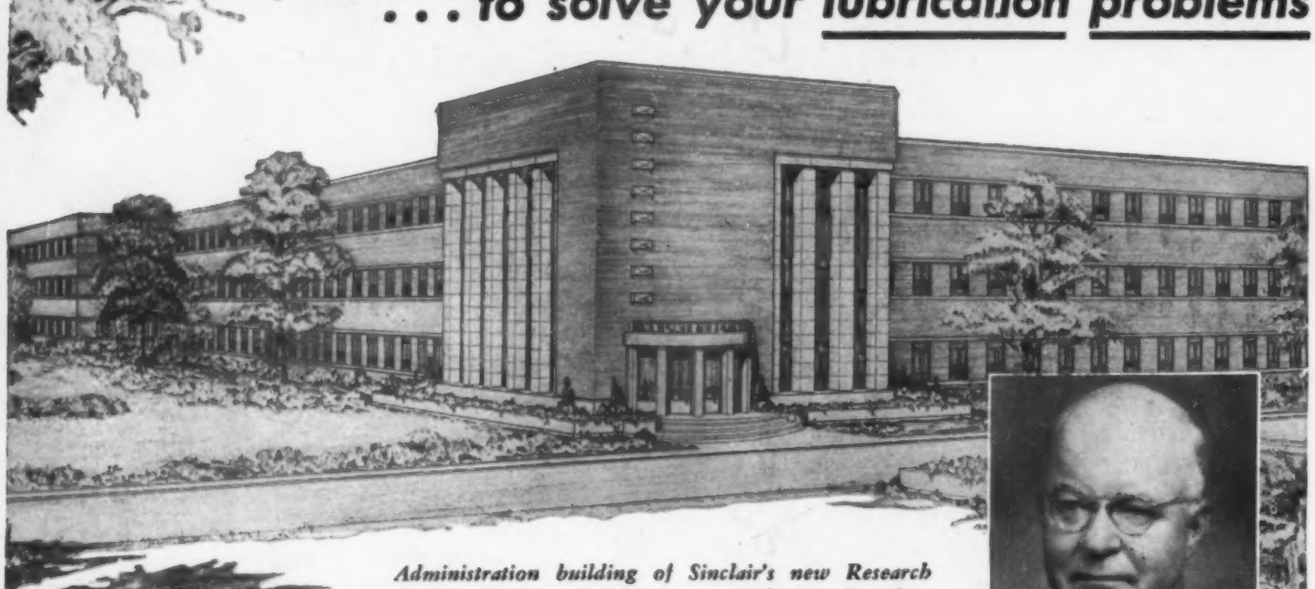
. . . to solve your lubrication problems



Administration building of Sinclair's new Research Center at Harvey, Ill. E. W. Isom, at right, Vice President in charge of Research, was recently awarded the famed Stevens Institute Medal for the most outstanding contribution to petroleum engineering.

Sinclair is completing a new $4,000,000 petroleum research and development laboratory at Harvey, Ill. This great research center — to be the most modern and best equipped in the industry — climaxes more than 30 years of consistent achievement in the development of superior products for the solution of your most difficult lubrication problems.

The outstanding skill and vast technical knowledge of recognized experts in the petroleum field will continue to serve you at Harvey as they have for so many years at East Chicago.

For tested, proven lubricants . . . *designed by special research for specific industrial application* . . . rely on *Research-Wise Sinclair.*

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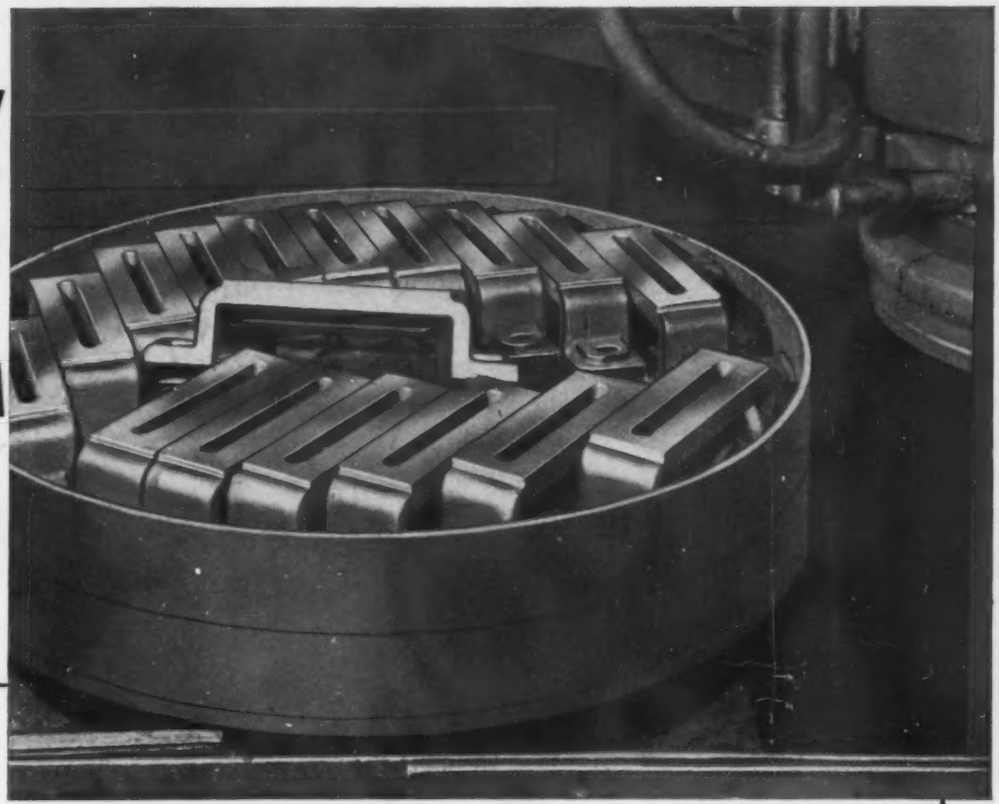
6 REASONS WHY A BLANCHARD

"HOGGED" THIS JOB AWAY FROM A PLANER



THE JOB...

● The illustration shows 17 doffer drawing pulley brackets being held on a 36-inch chuck of a No. 18 Blanchard Surface Grinder. Material is cast iron. Rough size $15\frac{3}{8}$" x $3\frac{1}{2}$" x $3\frac{3}{4}$". Two sides—the top and the feet—are ground, in two operations, to make the height $3\frac{7}{16}$". Commercial finish required.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

1. Greater PRODUCTION: Previously planed in 43.8 minutes each. *Now Blanchard-Ground in 5.4 minutes each, or in* $\frac{1}{8}$ of the time previously required.

2. Saved a FIXTURE: Blanchard Grinding eliminates the use of a holding fixture previously necessary.

3. Saved MATERIAL: Blanchard Grinding permits less allowance for finish, and saves many pieces that would otherwise have been "salvage".

4. Greater FLATNESS:
5. Finer FINISH:
6. Closer LIMITS:

These are so effortlessly produced by Blanchard Grinding that—on jobs such as illustrated—you get all three of them as "by-products" from the use of:

THE MOST EFFICIENT METHOD OF PRODUCING FLAT SURFACES

BLANCHARD

Whether your grinding requires hogging cuts or light finish cuts, fine finish and/or extreme accuracy, avail yourself of Blanchard *Free Consultation Service.* Another Blanchard Service is *Sample Grinding* on which you pay only the transportation charges.

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Specify MO-MAX HIGH SPEED STEELS *for your...*

MILLING CUTTERS

Only MO-MAX GIVES YOU ALL THESE ADVANTAGES

1. MO-MAX has superior cutting qualities.
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3. MO-MAX is economical. Its specific gravity is about 8% less than that of 18% tungsten steel.
4. MO-MAX is available in a standardized composition; also in cobalt and high vanadium varieties for special high speed steel requirements.
5. For 14 years MO-MAX has demonstrated its superiority in all types of cutting tools.

Learn all the facts! **Send for your copy of the MO-MAX Handbook, sixth edition. Get the full story about this remarkable steel, including easy-to-follow instructions on heat treating.**

THE CLEVELAND TWIST DRILL COMPANY

1244 East 49th Street • Cleveland 14, Ohio

Buyer's Guide to Brands of MO-MAX

"LMW"	Allegheny Ludlum Steel Corporation
"MOHICAN"	Atlas Steels Limited
"BETHLEHEM HM"	Bethlehem Steel Company
"MO-CUT"	Braeburn Alloy Steel Corporation
"STAR MAX"	Carpenter Steel Company
"MOLITE M-1"	Columbia Tool Steel Company
"REX T-MO"	Crucible Steel Company of America
"DI-MOL"	Henry Disston & Sons, Inc.
"HI-MO"	Firth-Sterling Steel Company
"REX T-MO"	Halcomb Steel Company
"MOGUL"	Jessop Steel Company
"TATMO"	Latrobe Electric Steel Company
"MIDMAX"	The Midvale Company
"S. T. M."	Simonds Saw & Steel Company
"MO-TUNG"	Universal-Cyclops Steel Corporation
"S-N-2"	Vanadium-Alloys Steel Company
"VUL-MO"	Vulcan Crucible Steel Company

"High Output... Very Accurate"

SAYS GENERAL DROP FORGE CORP BUFFALO, NEW YORK

In the illustration, a 3S Lodge & Shipley Acme Turret Lathe is being used to bore, face and turn a hollow shaft for the automotive industry.

Producing axles and shafts, the General Drop Forge Corp, Buffalo, N. Y., keeps its Lodge & Shipley Acme Turret Lathes busy on this work. Hard, close-grained metal is turned at substantial rates and cut with high speed tools.

The 3S-28" Universal Turret Lathe offers improved design and large capacity . . . with an abundance of power and rigidity, ample speeds and feeds for production turning with today's modern tooling.

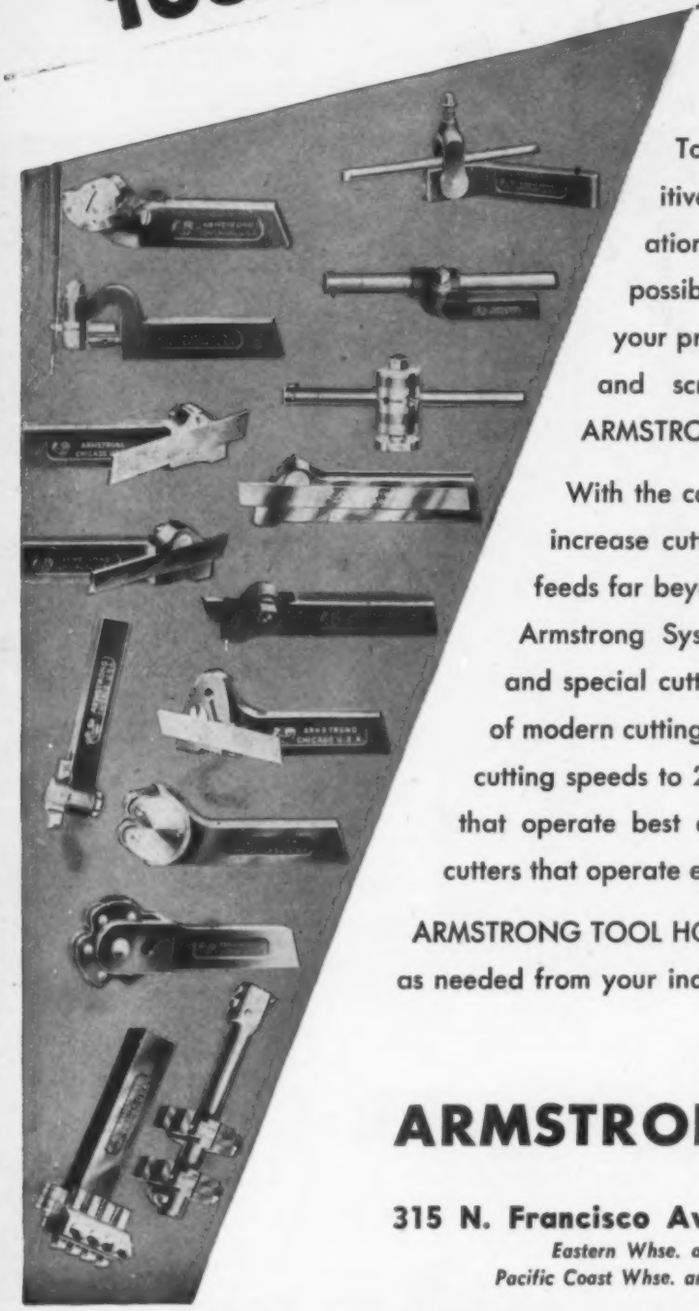
Lodge & Shipley Acme Turret Lathes are produced in Way, Saddle and Ram types in a wide range of sizes with accessories for practically every type of production. *Ask your nearby Lodge & Shipley Representative to show you Acme Turret Lathes in action . . . or write for free catalogs.*

ENGINE · TOOL ROOM
MANUFACTURING · DUOMATIC
(AUTOMATIC) HOLLOW SPINDLE ·
TURRET LATHES · GAP LATHES ·

THE Lodge & Shipley COMPANY
CINCINNATI 25, OHIO

MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.

ARMSTRONG TOOL HOLDERS



Produce more at lower cost with ARMSTRONG TOOL HOLDERS

Today's problem of producing more without prohibitive costs is easily answered on many machining operations by the Armstrong System of Tool Holders. It is possible to materially increase output per man hour on your present lathes, planers, slotters, shapers, turret lathes and screw machines, by simply using the correct ARMSTRONG TOOL HOLDER for each operation.

With the correct ARMSTRONG TOOL HOLDERS you not only increase cutting efficiency but can safely step up speeds and feeds far beyond those ordinarily used. Included in the modern Armstrong System are special ARMSTRONG TOOL HOLDERS and special cutter bits and blades that cover the complete range of modern cutting speeds. ARMSTRONG HIGH SPEED cutters for all cutting speeds to 200 f.p.m., ARMALOY (Cast alloy) Bits and Blades that operate best around 300 f.p.m. and ARMIDE (carbide-tipped) cutters that operate efficiently at rates as high as 600 f.p.m.

ARMSTRONG TOOL HOLDERS, Bits, Blades and Cutters, can be picked up as needed from your industrial distributor.

Write for Catalog

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. Francisco Ave. **Chicago 12, U. S. A.**

Eastern Whse. and Sales: 199 Lafayette St., New York 12, N. Y.
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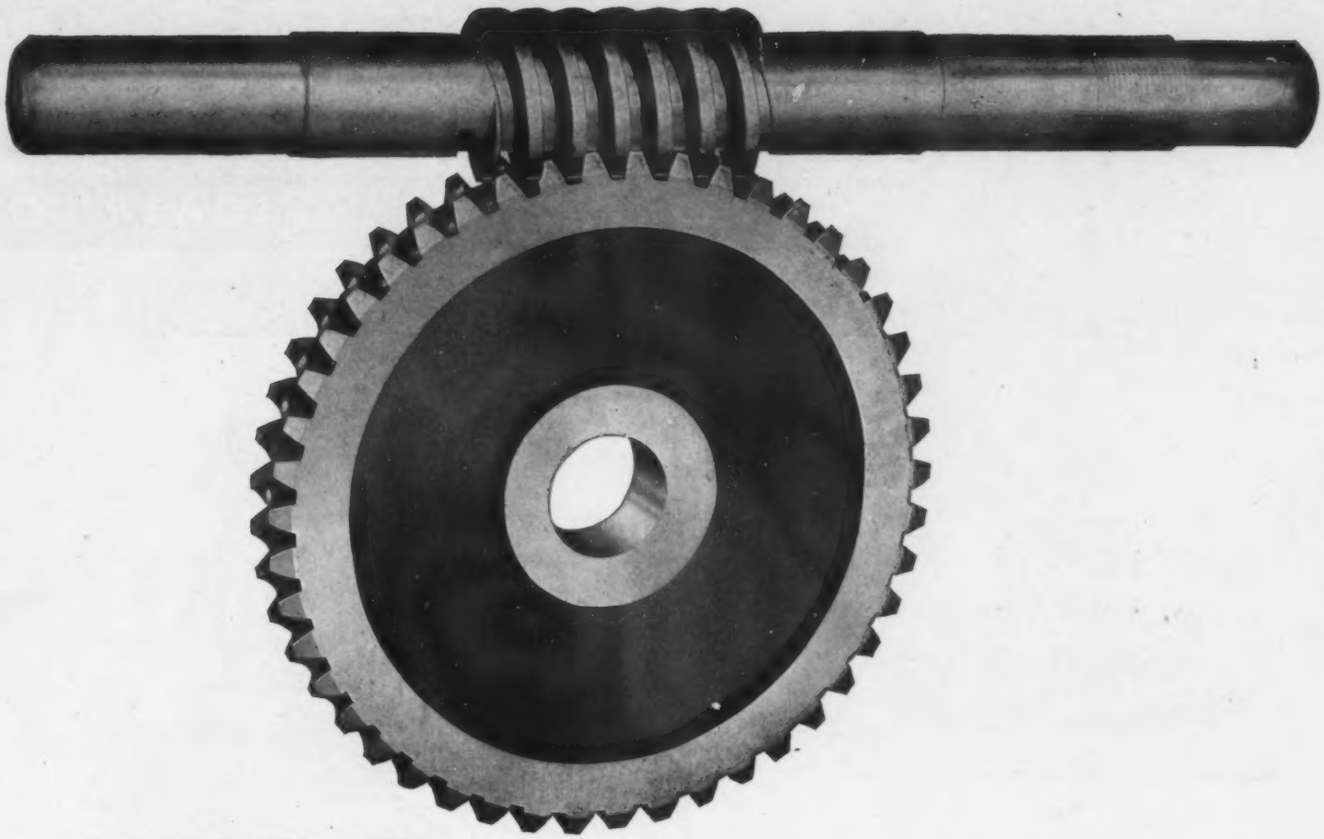

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- HELICAL GEARS
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- SPROCKETS
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- RATCHETS
- SPLINED SHAFTS
- RACKS
- LEAD AND FEED SCREWS
- GROUND TOOTH GEARS (Spur and Helical)
- SHAVED TOOTH GEARS (Spur and Helical)
- GROUND THREAD WORMS

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Whatever your requirements, you'll find that it pays to have your gears made to order by specialists. Here at Adams we have the skilled personnel, the precision equipment and the specialized experience necessary to produce high quality gears made exactly to your specifications. The next time you need gears be sure to get in touch with Adams. THE ADAMS COMPANY, 1942 Bridge Street, Dubuque, Iowa.

The ADAMS Compa

Dubuque, Iowa, U. S. A.

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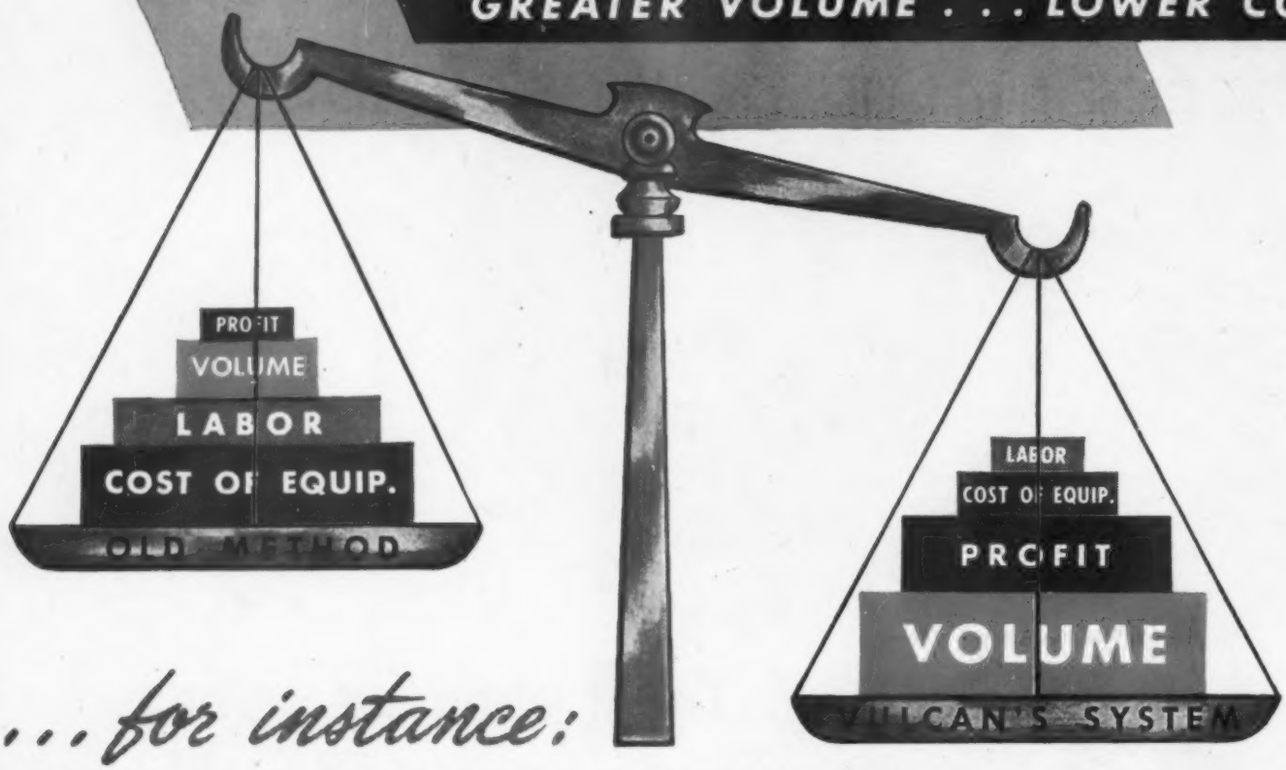
HYDRAULIC PIERCING SYSTEM

TIPS THE PRODUCTION SCALE TOWARD
GREATER VOLUME . . . LOWER COST



. . . for instance:

HOLE-PIERCING FLANGE OF REFRIGERATOR DOORS

"This is an honest scale"—here is the factual proof. This Vulcan Hydraulic Hole Piercing Unit frees four punch presses for other work. It eliminates multiple die costs and maintenance. It needs only one operator. Every seven seconds it pierces all holes in the flange of a refrigerator door. It can be quickly adjusted for any door sizes, lefts or rights.

• • •

To meet competition, you need greater volume and lower costs. Vulcan's thirty-two years of experience in designing and building special machinery can help you combine many high cost operations into one low cost job—for instance, a refrigerator door.

Vulcan Tool Co.
DAYTON 10 • OHIO • U.S.A.

Our application engineers, located in strategic areas, will be glad to discuss any of your metal piercing operations in order to lower costs, increase volume.

Vulcan is proud that 87% of its customers for tools, dies, jigs, fixtures are loyal repeaters — (God bless 'em).

4 MILLION HP CONFIRMS IT

FOR TOUGH MOTOR JOBS, YOU CAN'T BEAT

TRI/CLAD

EXTRA PROTECTION

To date, a million and a half Tri-Clad motors, with a total output of over 4-million horsepower, have been purchased by American industry!

In every kind of plant from steel mill to dairy, these motors are proof beyond doubt that you can't beat Tri-Clad extra protection for tough motor applications. Even on jobs where special protective enclosures would ordinarily have been specified, Tri-Clad open motors, applied during the war years, have stood up to heat, dust, and dampness, operating smoothly and efficiently for years with only minimum maintenance.

Today, the Tri-Clad motor family includes many different types and sizes. But whatever your selection, the Tri-Clad motor nameplate is still your best assurance of a high return on your motor dollar. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

EXTRA PROTECTION . . . AGAINST PHYSICAL DAMAGE!

Rigid cast-iron frame and end shields protect vital motor parts from external abuse. Because they're not at the mercy of a coat of paint, they strongly resist chemical attack and dampness. Cast iron also gives you wide, nonyielding fits between end shields and frame for ease of assembly.

EXTRA PROTECTION . . . AGAINST ELECTRICAL BREAKDOWN!

Motor windings of Formex* wire, together with improved insulating materials, reduce the chances of electrical failure. Heat is dissipated quickly —motor stays young for years and years!

EXTRA PROTECTION . . . AGAINST OPERATING WEAR AND TEAR!

Bearing design affords longer life, greater capacity, improved lubrication features. Bearing seals retain lubricant, keep out dirt. One-piece, cast-aluminum rotor is practically indestructible.

*Trade-mark Reg. U.S. Pat. Off.

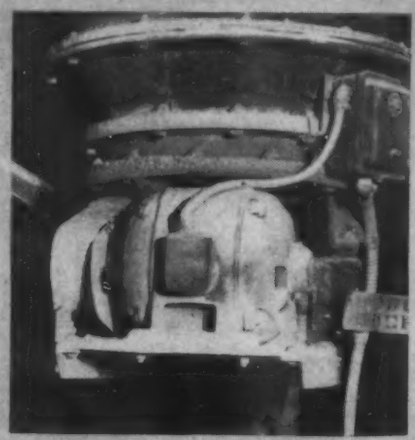
The toughest TRI/CLAD ever built!

Newest addition to the Tri-Clad motor family is the Tri-Clad totally enclosed, fan-cooled motor for use in adverse atmospheres. It gives you these important construction features:

- *A cast-iron, double-wall frame which completely encloses and protects the windings and punchings.*
- *A nonshrinking compound around motor leads which protects motor interior from dust and moisture.*
- *A rotating labyrinth seal which further protects the motor interior from damage by foreign matter.*

GENERAL ELECTRIC

750-287C



THE ALUMINUM ORE COMPANY operates one of the world's largest hydrofluoric acid plants at East St. Louis, Ill. It is a modern plant and uses many electric motors in its highly mechanized materials-handling systems. As a rule, special protective enclosures are used to keep out fumes and dust. But in this case the Tri-Clad open (dripproof) motor you see here has been in service for five years without a single failure. It has operated continuously —24 hours a day, seven days a week. Yet the only maintenance required has been periodic inspection and lubrication. Behind the unusually fine service record of this motor is the extra protection built into every Tri-Clad motor. It's in there for keeps to give you better motor performance at lower cost.

TRI/CLAD

REG. U.S. PAT. OFF.

MOTORS

- OPEN (DRIPPROOF)
- TOTALLY ENCLOSED
- EXPLOSION - PROOF

Isn't this what you want
in SAND CASTINGS?
FAST HELP on design
FAST PRICE quotations
LOWEST PRICE consistent with
HIGH-QUALITY castings
FAST DELIVERY
ALUMINUM'S BIG ADVANTAGES
You can get ALL 6 from the BEST source
for ALUMINUM SAND CASTINGS
ALCOA
ALUMINUM
ALCOA

PLUS

DEPENDABLE QUALITY

Today...Tomorrow...Always

Let's "TALK TURKEY"

When you buy aluminum castings from Alcoa, you get the benefit of our 60 years of handling tough castings jobs, unusual jobs, the jobs that call for know-how, research, trail blazing, even plain trial and error.

Your castings job gets the benefit of all this knowledge, *plus* the finest in research and development work, *plus* every type of testing equipment, *plus* ultramodern foundries, PLUS the brains, skill, and hands of Alcoa's "old sand hogs" who have been making Alcoa Castings most of their lives.

Only from Alcoa do you get all these pluses! When you need sand castings, order them from Alcoa . . . your best source of the best aluminum sand castings today, tomorrow, always. Prompt service from one of Alcoa's four convenient foundries . . . at Bridgeport, Cleveland, Detroit, Los Angeles. Ready to serve you NOW on sand or permanent mold castings.

Write to ALUMINUM COMPANY OF AMERICA, Alcoa Castings Engineering Service, 2107 Gulf Building, Pittsburgh 19, Pa. Sales offices in 54 principal cities.

4 OF THE 12 POINTS THAT MAKE ALCOA CASTINGS BETTER

Melting temperatures **are controlled by precision electronic instruments to avoid overheating the melt. This is important to control grain structure in castings.**

X-Ray control **assures the proper location of gates, risers, and cores. Tells what's what inside the casting.**

Heat treatment **of aluminum castings is done in modern furnaces equipped with supersensitive thermostatic controls to hold temperatures within narrow limits. An order of castings receives identical heat treatment from batch to batch.**

Sharp-eyed, experienced inspectors **give each finished Alcoa Casting a thorough going over, make sure that all the castings you receive are sound and true, accurate in all dimensions.**

FIRST IN ALUMINUM

SPRINGFIELD LATHES

turning steel forming rolls used in the manufacture of Quonset Huts

● Meeting exacting requirements in the manufacture of steel forming rolls is no easy assignment. Yet Tishken Products find Springfield lathes meet all forming roll specifications as to size —accuracy—and finish. In fact they use this battery of Springfield Lathes exclusively on all roll jobs.

They have learned from long experience the precision—high productivity—and low costs possible with Springfield lathes on difficult roll turning operations. They have also found that the adaptability of these machines for a host of precision turning operations makes them an asset to any shop.

Perhaps your work does not include roll turning but if it requires close tolerances—smooth finish—and uniformity you can rely on a Springfield Lathe.

SPRINGFIELD LATHES are available in a full range of sizes from 14 inch to 30 inch inclusive. There is also a selection of attachments which further increases the utility of these machines.

• • •

Write for bulletins on the sizes in which you are interested or if you have a special turning problem consult one of our engineers.

• • •

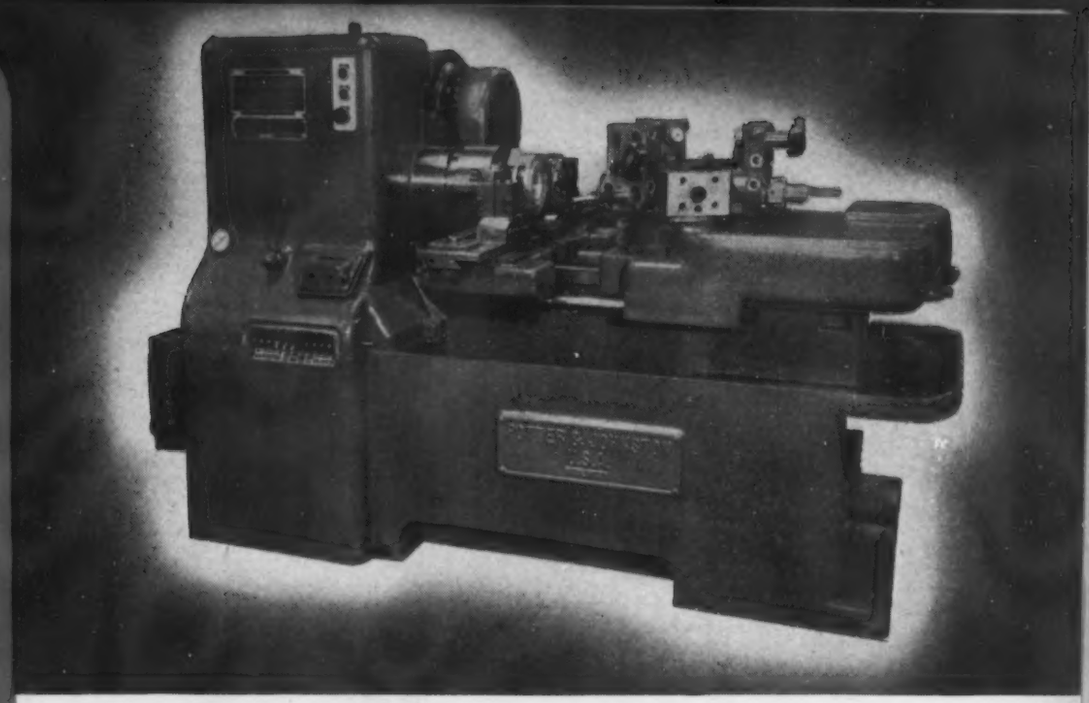
THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD • OHIO • U. S. A.

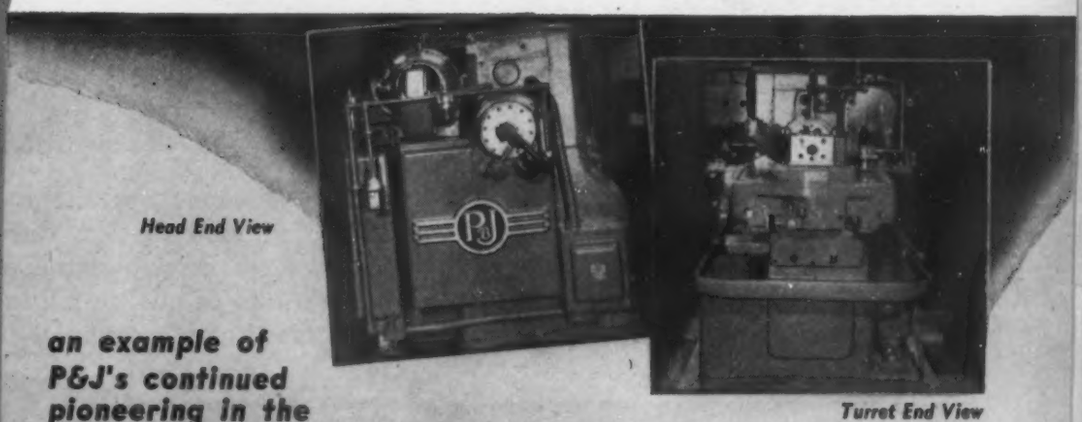
P&J

4D
4DE
5D
5DE
5DL
5DEL
5D²9"
5D²12"
5D²15"
6DRE
6DREL
6DRELX
6DS
6DSE
8DT
8DXT
9D

and



NOW the NEW 3-U SPEED-FLEX



Head End View

Turret End View

an example of P&J's continued pioneering in the design and development of

AUTOMATIC TURRET LATHES

Among the features of this fast machine for machining small work, which make possible exceptionally high output per spindle, is Electro-Pneumatic Control of Speed and Feed Changes and Rapid Traverse.

The following are some of the outstanding advantages achieved:

. . . Split Second Timing . . . change from rapid traverse to feed, or vice versa, accomplished in 1/5th second.

. . . Turret Slide can drop from rapid traverse into feed for ¼" travel and return to rapid traverse in 2 seconds under set up conditions of top speed and 10 thousandths feed per R.P.M.

. . . Rapid Traverse Movement of turret slide and cross slides for one complete cycle of machine accomplished in 24 seconds.

Other features contributing to maximum performance as well as convenience, accuracy and economy are:

. . . rigidly constructed turret slide, with turret clamped in position after indexing. Turret indexed by means of a Geneva motion.

. . . turret location maintained in alignment with spindle by action of a locking and binding wedge.

. . . safety cut out switch in case of air failure.

. . . automatic stop at completion of work cycle.

. . . full electrical controls.

The new P&J 3U Speed-Flex Automatic Turret Lathe will machine small castings or forgings up to 6" diameter and 4" long.

Further details are available on request.

OTTER & JOHNSTON MACHINE CO.,

Pioneer Manufacturer of Automatic Turret Lathes

PAWTUCKET, R. I.

150 to 425

YES . . . in a recent comparative performance test, 150 Aber "Curved Tooth" milling cutters *out-performed* 425 conventional type milling cutters — a 2½ to 1 increase at NO EXTRA COST!

Designed and developed specifically for production men who look to NEW tool designs to reduce top-heavy metal cutting costs, Aber "Curved Tooth" milling cutters operate at speeds 10% to 25% faster than standard straight tooth milling cutters in addition to providing smoother finishes and close to tolerance operations. Utilizing the most outstanding tooth design developed in the past decade, Aber Engineering Company produces a complete line of quality milling cutters featuring the "Curved Tooth" principle.

A TYPICAL ABER "CURVED TOOTH" PERFORMANCE

OPERATION: Milling lugs on plate. Slotting and side milling parallel sides.

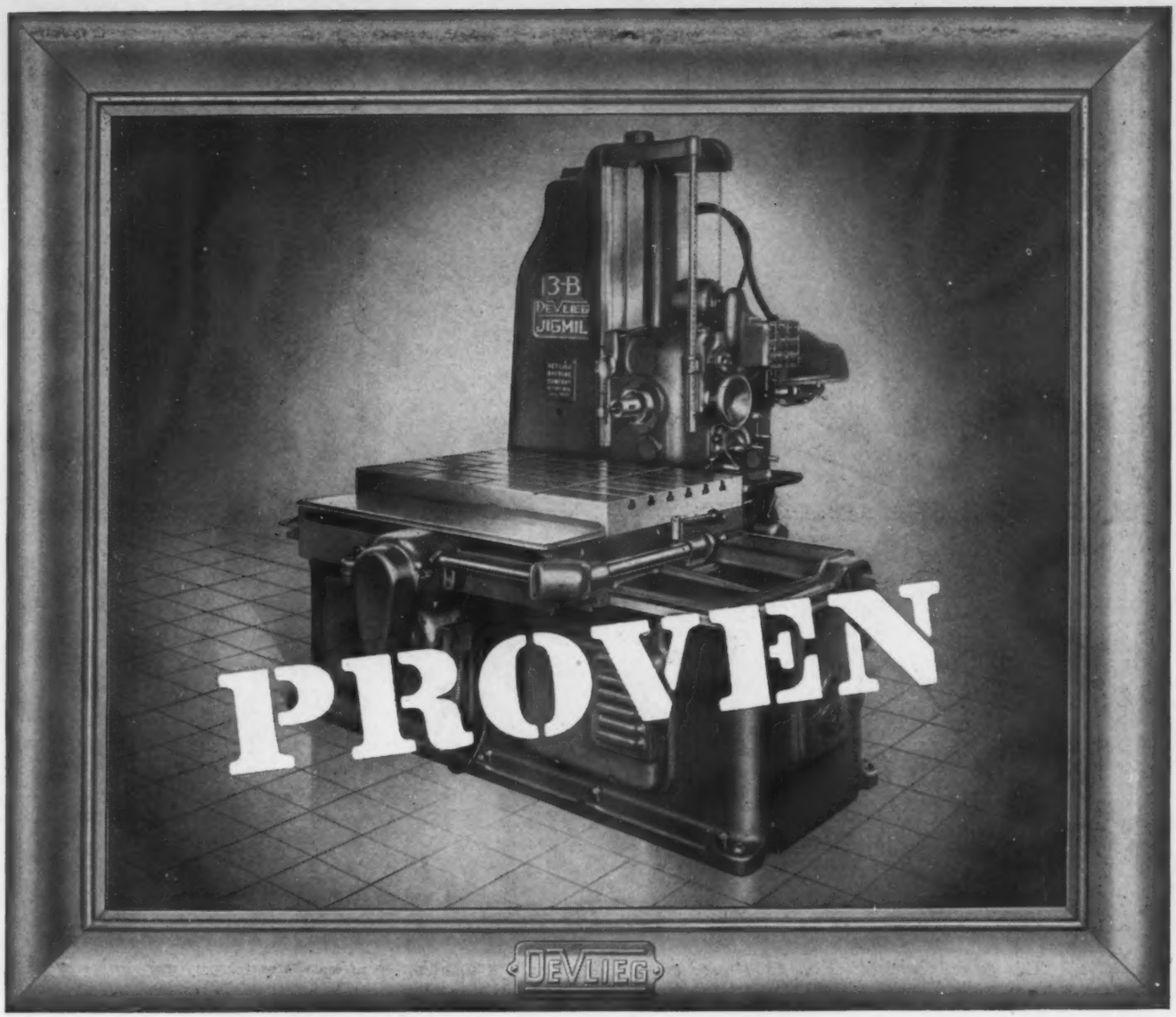
MACHINE: Cincinatti 3-Spindle Mill.

TOOL SETUP: (1) R. H. and L. H. Shear Side Milling Cutter.
(1) R. H. Half Side Milling Cutter.
(1) L. H. Half Side Milling Cutter.
Feed: 10-1 2"

PERFORMANCE: 16-1 2 hours between grinds. Best previous practice with conventional, straight tooth H. S. S. milling cutters was 6-1 2 hours between grinds.

KEEP UP TO DATE with tool design progress. Write today for more detailed information on the ABER line of "Curved Tooth" milling cutters.

ABER
ENGINEERING WORKS INC.
WATERFORD, WISCONSIN



The World's Finest Boring and Milling Machine

THIS model 3-B JIGMIL has automatic power means to position the spindle from one location to another accurately to within much less than .0001 (one-ten thousandths part of an inch) Thus, extreme laboratory accuracy is conveniently available with ordinary skill that would normally make such precision very high in cost. This, and many other refinements, go further to prove that the JIGMIL Idea is a totally new approach to the problems of precision boring at a new low cost.

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

"Which Squirrel-Cage Motor Shall I Buy?"

Open-Type? This general-purpose squirrel-cage motor meets about 9 out of every 10 application requirements; so chances are it's the design you'll select. Allis-Chalmers builds generously proportioned, rugged *open-type* squirrel-cage motors in sizes from 1 hp to the largest practical requirement.

Splash-Proof? Where operating conditions are conducive to entrance of particles or liquids into ordinary motors from either top or sides, Allis-Chalmers *splash-proof* squirrel-cage motors may be your best buy. They're designed to *exclude* top or side directed particles and liquids. Sizes 1 hp to the largest.

Vertical? or Flange-Type? *Either* can solve a space problem. *Vertical* motors (sizes 1 hp to largest) for vertical drives. *Flange-mounted* for side or angle drives. In both types bearings and closures are designed to prevent grease escapement. Mounting flange for attaching to your base can be provided.

Totally-Enclosed? Explosion-Proof? Completely weather-proof and fan-cooled, these motors are built to beat abrasive dust, dirt and corrosive fumes, or moisture conditions that cause windings in ordinary motors to deteriorate. *Explosion-proof type* for oil refineries, paint, varnish or lacquer plants, etc.; Underwriters approved; reduce hazards in explosive or dust atmospheres. Either type built from 1 hp and up.

Are Motor Decisions More Important Today?

YOU BET THEY ARE! One *obvious* reason is the need for keeping costs down. Another is that in the rush to fill demand much equipment is being misapplied; making it harder to maintain profits not alone today, but tomorrow, the next day and the next year—as long as misapplication continues!

That's why it's important to take a good look at motors — their characteristics — your equipment — power source and surroundings — *before* you buy and apply! If you're in doubt, don't take chances — call a motor expert! ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 2327

1847 1947 A CENTURY OF SERVICE to Industry THAT MADE America Great

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment-
Biggest of All in Range of Industrial Products

The problems involved in grinding holes in the end of a shaft often make production men lead a dog's life. Now, with the Bryant No. 112-M these problems are solved quickly and accurately. This machine is designed to finish bores up to 9 inches deep in the end of parts such as machine tool spindles, arbors, shafts, etc. The work table is arranged so that parts may be held either in the hollow work spindle and steadyrest or in a special fixture so that a spindle can be ground on its own bearings. The workhead and steadyrest have longitudinal adjustment and can be swung for grinding standard tapers (Brown & Sharpe, MMS, Morse, Jarno, etc.) up to 30° included angle. Reverse tapers up to 10° included angle can be ground.

The wheelhead can be either belt driven (standard) or direct drive for high wheel speeds.

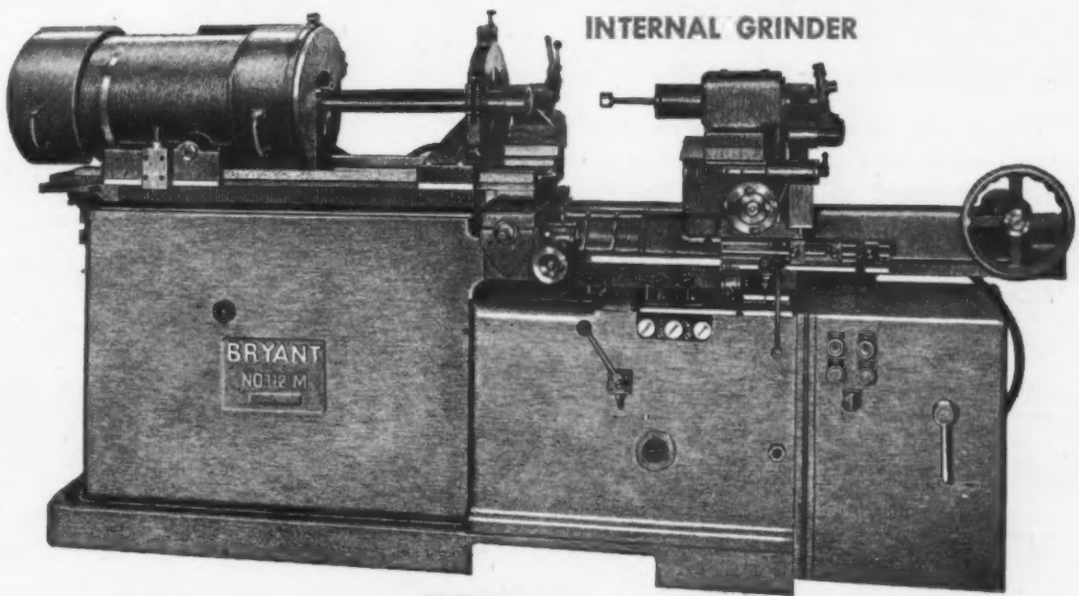
To facilitate loading and gaging, the wheelhead moves 8" to the rear. This same roller bearing slide provides cross-feed for sizing. The workhead (with 16" diameter swing) and the wheelhead are precision ball bearing construction. The axial wheelhead slide is a hardened steel bar riding on pressure lubricated bearings.

The controls include: variable speed in workhead by hydraulic motor 100 to 1,000 r.p.m.; variable rate for work and truing traverse; power cross-feed with variable rate; calibrated depth stop for facing operations; quick set reversing dogs to control position and length of wheelhead traverse.

An extra workhead is available to index 180°. This is to assure concentricity of bore at the ends of a shaft.

Write for the new Bryant No. 112-M catalog sheet which gives complete details.

NO. 112-M HYDRAULIC INTERNAL GRINDER



Send for the Man from

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

BRYANT

Use the SUNNEN Precision Honing Machine

To Reduce Finishing Costs on Internal Diameters from .120" to 2.625"

You can produce a full bearing surface in any hole—in steel, cast iron, bronze, aluminum, carbides, ceramics, plastic, or glass—with a guaranteed accuracy of .0001". A complete line of abrasives is available to produce any degree of surface finish desired.

The Sunnen Precision Honing Machine is versatile. It provides real savings in long run production costs, and even greater savings on job lots and short runs when frequent size changes are necessary.

For PRODUCTION Work

Duplicates sizes quickly and accurately. Saves time—new developments in abrasives allow greatly increased production. Often replaces preceding grinding and reaming operations with greater accuracy and lower total cost per piece. Straightens and rounds up holes with minimum stock removal. Corrects heat-treat distortion. Removes burrs and flash from drilled, machined or punched parts.

For PRECISION Honing

Is being used to hold tolerances as close as .000025" and to produce down to 2 micro-inch finish in hardened steel. Hones perfectly straight round holes, free from bell-mouth and taper. Many times faster than lapping, at much lower cost. The Sunnen Precision Honing Machine is ideal for tool rooms—used for fitting dowel pins, ejector pins, etc.

In addition, the Sunnen Precision Honing Machine is easily set up in one minute. Often on short runs the job can be completed faster than set-up can be made on other machines. No jigs or fixtures are required.

Find out how Sunnen Honing can help you save time and reduce costs. Call in a Sunnen engineer or write for bulletin giving complete information.

Typical Examples

Two lands, 3/8" long, honed in perfect alignment.

Smooth surfaces provide long life for washing machine parts.

Smooth finish and close tolerance easily held on 1 1/8" hole in steel vibrator body.

Tolerance, .0002", finish of 10 micro-inches produced on these sewing machine parts.

Bell-mouth eliminated, production increased on these line reamer bushings.

SUNNEN

TRADE MARK REG U S PAT OFF • MARCA REGISTRADA

SUNNEN PRODUCTS COMPANY

7941 Manchester Ave., St. Louis 17, Mo.

Canadian Factory: Chatham, Ontario

267

Look to MODERN for accurate, fast, economical thread cutting

Hardened and ground throughout

Wider threading range

Made with least number of parts

Cut close-to-shoulder threads without special chasers

Easily adjusted for thread size

Greater flexibility

Quick and easy chaser change

MODERN

STATIONARY TYPE SELF-OPENING

DIE HEADS

Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

Modern Self-Opening Die Heads thread diameters from 1/8" to 7" in standard heads, and up to 14" in special heads . . . accurately, fast, and economically. They are adapted to practically every thread cutting operation within their capacity. Designed for use in hand screw machines, turret lathes, and other machines where the die heads are used in a stationary position.

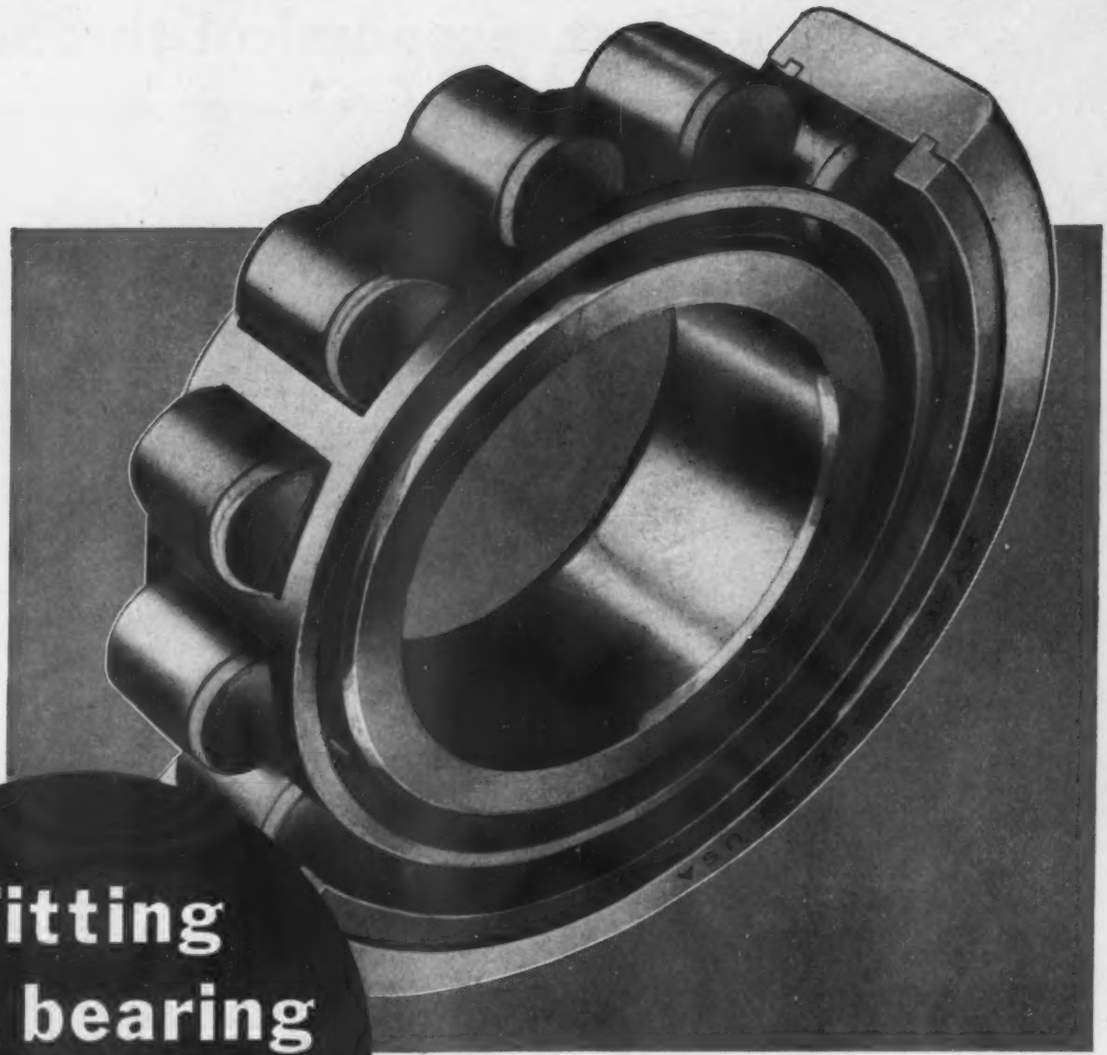
For complete information, write for Bulletin No. M-123

MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK



Fitting the bearing to the Job

What may seem a toughie for you, may be simply solved by the Hyatt Engineering Staff.

These men know just how, why and where Hyatt Roller Bearings fit in almost any design—to meet your specific requirements.

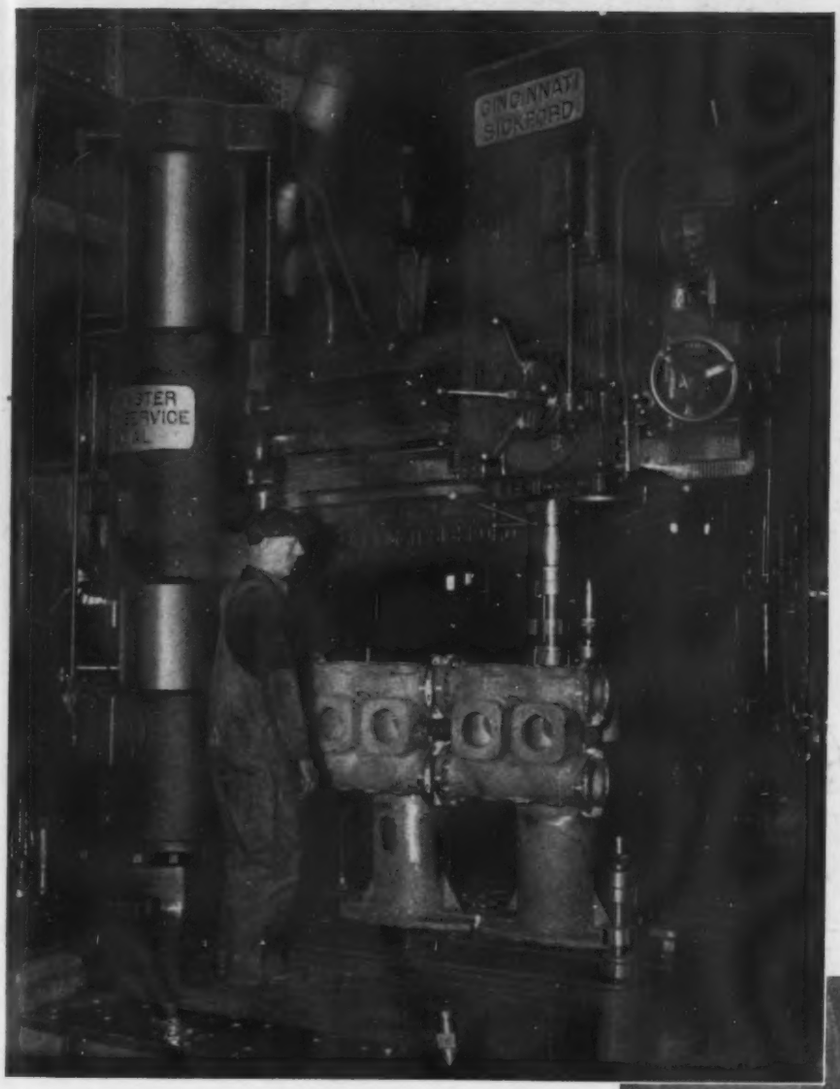
Speed—load—position—every factor will be studied and you'll get the right answer.

For fifty-five years Hyatt has served automotive — industrial — agricultural and transportation folks with the finest roller bearings.

Let's work together on your next bearing problem to fit the bearings to the job not the job to bearings. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

THE master OF THE JOB ...



For the really big job, Cincinnati Bickford Master Super Service Radial Drills—the largest and most powerful radial drills built—give outstanding service.

Forty horse power, constant speed driving motor—spindle speeds from 12 to 1200 r.p.m., or from 6 to 600 r.p.m., insure efficient drilling or boring of holes from ¼" to 16" in diameter.

Very large, heavy castings are handled on these Master Super Service Drills—with their 7' to 12' arm and their 22" to 26" diameter columns. The operator controls these massive Radial Drills with ease—all operating levers being centralized low on the head.

o

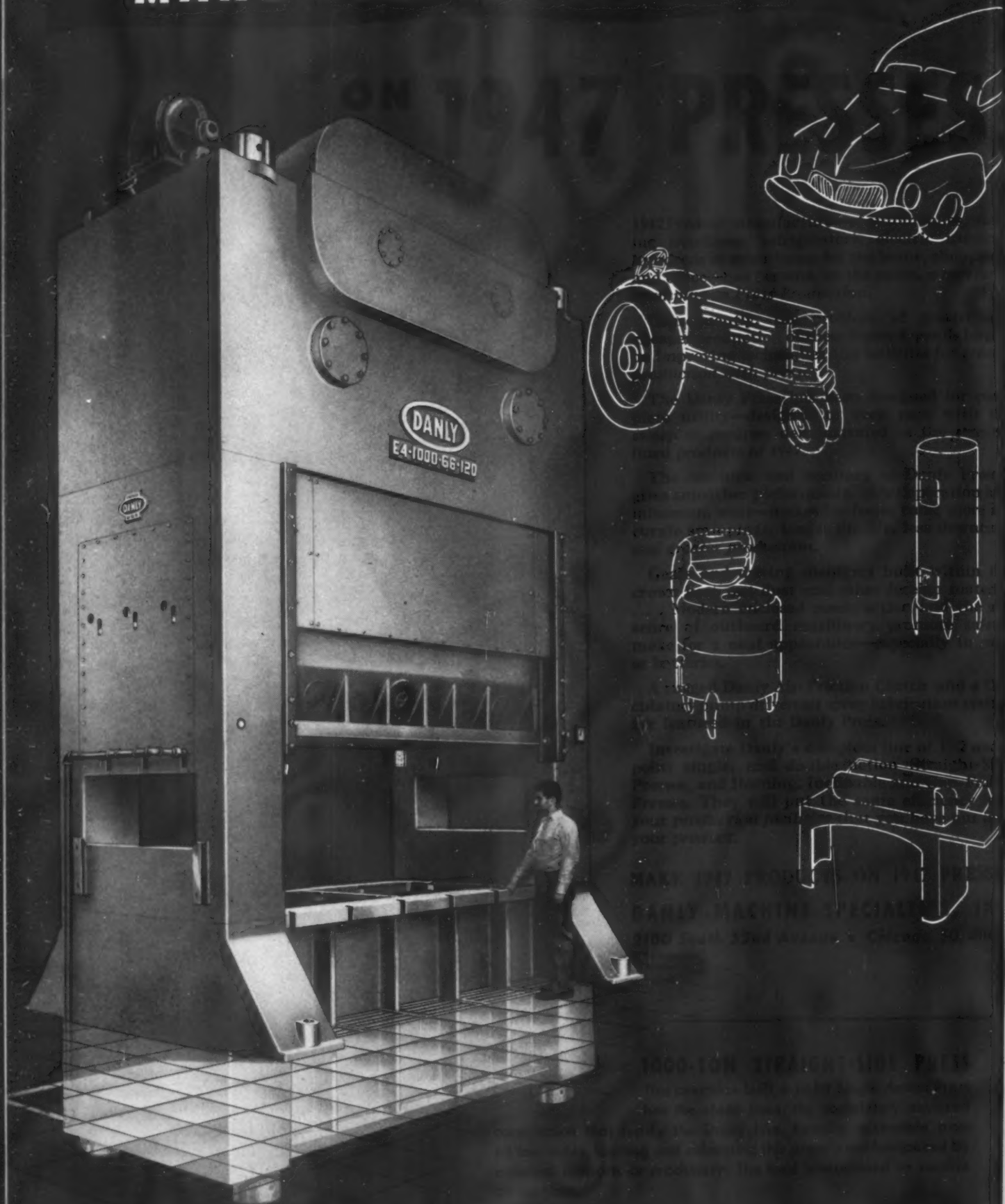
If your job requires unusual power, rigidity and capacity in the machine, write for Circular R-22 on the Cincinnati Master Super Service Radial Drills—the masters of the job.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Equal Efficiency of Every Unit
Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

MAKE 1947 PRODUCTS



DANLY

..THE PRESS FOR MODERN PRODUCTION

American Machinist's Spot NEWS OF METALWORKING

Recent refusal of CIO workers to allow Russian engineers to learn how to run their machines at a western Michigan plant focuses attention on what the State Department is permitting. Russians propose to learn how to make axles in mass production the way one of leading U. S. companies does. They are buying similar or better machines than this company, want to build 30 heavy diesel trucks per hour.

High cost of bringing out new car models is shown by fact that Hudson is spending $14 million for completely new body and chassis and one new engine. Packard, with new bodies on three models and two new eight-cylinder engines, has invested $21 million. General Motors is spending $75 million.

Over 1 million tons of iron and steel scrap will have been delivered to the steel industry in the March-December period from Army, Navy, Maritime Commission and WAA yards, according to current estimates. Some 1.2 million tons will be made available in first half of '48 from same sources.

One engine company is buying cylinder castings from a foundry 200 miles away which is located next to a second engine company. The second engine maker is getting castings from a foundry in the same city as the first engine company. High costs are the inevitable result.

Here is official score of first six weeks' operation of Labor Relations Board under Taft-Hartley Law: Unfair labor practice charges filed—329 against employers, 71 against unions. Representation election petitions filed by 98 unions, 35 employers and four individuals. Decertification petitions filed by 59 individuals or groups.

Aviation manufacturers are pinning hopes of getting out of postwar slump on two air policy boards which will report early next year. The President's Finletter Commission is counted on to come up with recommendation for greatly expanded military purchases.

Steel shortages cannot be charged to disappearance of steel into inventory. Commerce Department survey shows practically no inventory accumulation during first half of 1947.

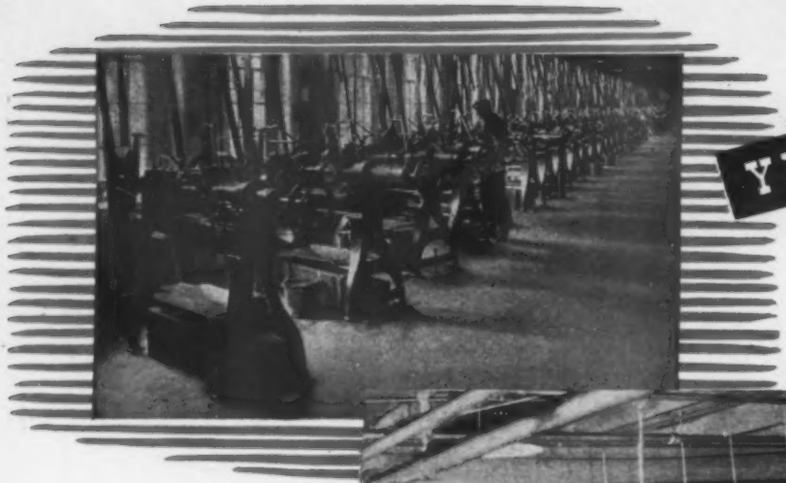
Dollar shortage facing Argentina has forced reconsideration of plans to modernize railroads. Program involves 320 passenger cars, 1000 freight cars, 85 locomotives, 735 box cars, 250 fruit cars, 300 stock cars, 250 oil tank cars, 300 gondolas and 350 gondolas with collapsible sides. Some of these orders have been placed in U. S., but others will now be diverted to Britain.

Steel company's plight: it wants to double its plant capacity, which cost $90 million. But today duplication of original plant would cost $180 million. It hasn't that much money available. If it could go ahead, it would have total investment of $270 million. In a recession it could not earn dividend or even make a profit on that basic cost. What is more, working capital would have to be tripled, not doubled, to handle the business.

Packard's new models will have 150 lb. more steel in them than old models, despite steel shortage. Company is purchasing slabs and billets and will have them rolled in Detroit district. It has on hand considerable stock of raw steel to protect its own production of cars. It hopes to build 75,000 of its 1948 models before next July 1.

Machine tools and electric power head the priority list of Japanese reparations requirements set down by Far East claimant nations. All the nations—China, Philippines, Indonesia, Burma—recognize their areas must depend on Japan as workshop for future industrial development.

Further news on pages 125-136



YESTERDAY...

TODAY

BETTER "LIQUID TOOLS" for METAL CUTTING

THE GREATER efficiency and speed of modern metal cutting are made possible largely by petroleum products . . . the "liquid tools" that keep cutting tools cool, sharp and long-lived for finer, faster machining.

For many years, Texaco research has worked closely with designers, makers and users of machine tools . . . developing lubricants and coolants that enable each new, improved metal working machine to function at its fullest efficiency . . . increasing production . . . improving finish . . . lowering costs.

As a result, Texaco has a complete line of cutting, soluble, grinding and hydraulic oils to meet every need . . . among them is a cost-saving, triple purpose oil for use on chuck-type automatics . . . an oil that serves as hydraulic fluid, machine lubricant and cutting oil.

A Texaco Lubrication Engineer specializing in cutting coolants will gladly assist you in the selection and proper use of the right cutting fluids to improve machining efficiency in your plant. Call the nearest of the more than 2500 Texaco distributing plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

VISIT TEXACO AT THE NATIONAL METAL EXPOSITION • International Amphitheatre, Chicago • Booth 2215 • October 18-24

TEXACO

TEXACO CUTTING, SOLUBLE AND GRINDING OILS FOR FASTER MACHINING

Tune in...TEXACO STAR THEATRE presents the TONY MARTIN SHOW every Sunday night. See newspaper for time and station.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

The New Challenge

Remember the critical war days? The only thing that we could be sure of each day was that a new production crisis would arise.

We comforted ourselves by thinking that those were abnormal times. When the war was won, we could relax.

But even after peace arrived, the crises continued with disheartening frequency. We feel that we still are living in abnormal times.

Each wartime crisis demanded ingenuity, courage and adaptability to a new situation. These same stalwart characteristics are needed today to deal with our postwar problems. They are being revealed increasingly by metalworking companies.

Let's illustrate. An automobile maker is short of steel. He wants to continue to operate. He is resorting to buying steel slabs and billets and having them rolled by a local mill. By this action he assures himself a continuing supply of essential steel.

A midwest company found its losses of parts in process too high under today's operating conditions. It installed 100% inspection between operations. Losses dropped from over 10% to under 2%.

A Philadelphia firm was not getting enough production from its men. The general manager, in a daring move, offered his men five-hours' pay for each unit assembled. The men responded in a big way. Time for making the unit fell to one-eighth the former time. Substantial cost-savings resulted.

Almost daily, word reaches us of some successful improvisation by management to meet a new crisis.

This is no time in metalworking, or anywhere else, for a faint heart and a stodgy, rigid mind. New challenges are springing up almost daily. Unless they are met quickly and effective, management is sunk. This is the day of open dealing with employees, with the community, with the public at large.

This is the day of new methods of doing things because the old way is costly and as outdated as the horse and buggy.

This is the day when management must be ready to shift with new conditions which confront it—new markets, new products, new materials, continuing shortages, high wages, high costs.

This is the day which demands and exacts high courage on the part of management. It demands an open mind, clear vision and the willingness to assume great risks to attain desirable goals.

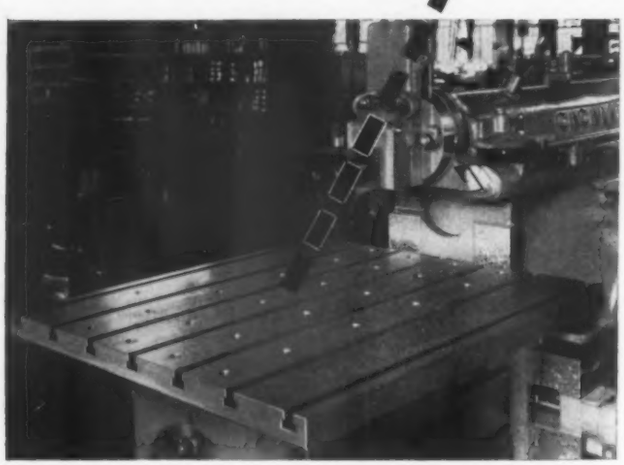
As long as American industry exhibits courage and daring and the ability to adapt itself to new situations, there should be no serious worry about any real challenge from outside quarters to the industrial supremacy of our country.

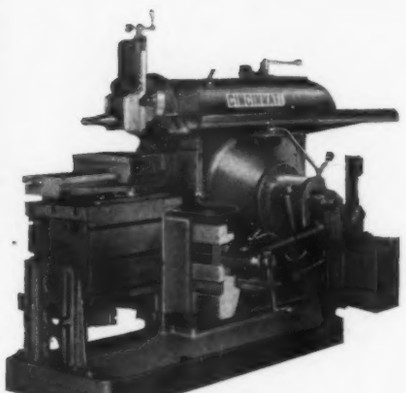
Burnham Finney

EDITOR

EXTRA CLAMPING SURFACE HERE...

Photo courtesy of
Marion Machine Foundry & Supply Company





Some castings are bulky and awkward to handle. Often they present a setup problem, as it may be difficult to clamp them firmly to the regular shaper table.

The large area of the Cincinnati Supplementary Table Top saves setup time, and the full clamping improves the accuracy. It is applied easily and widens the use of Cincinnati Shapers. It is just one of the many useful accessories available.

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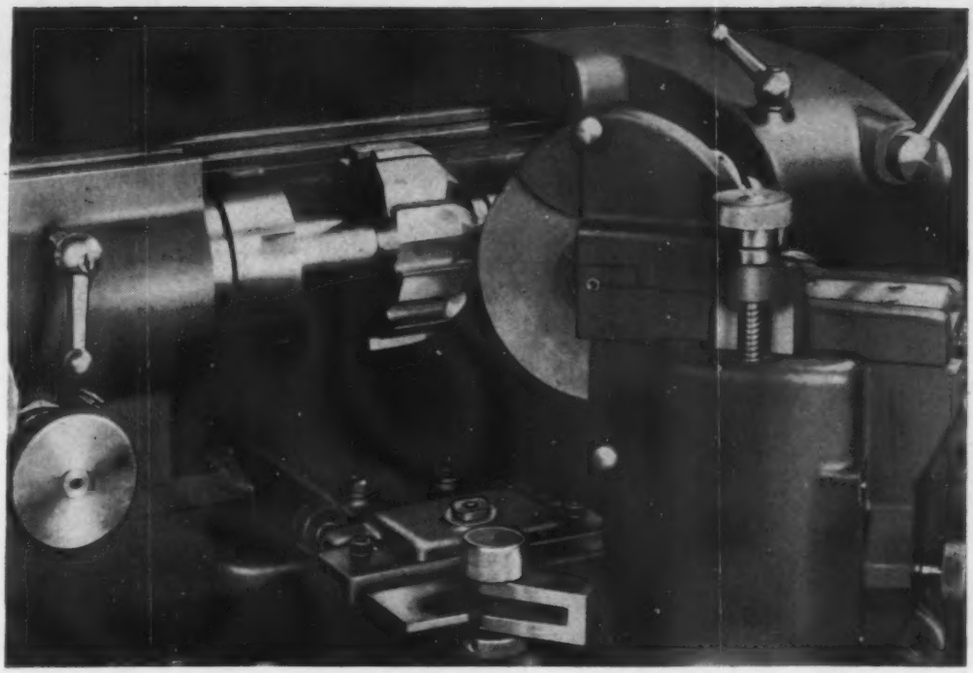


CONTOUR-GROUND cutters are sharpened along the profile of the formed cutting edge. Wheel movement around the formed edge is guided by a follower on the wheelhead base in contact with a stationary templet

HOW TO DESIGN FORM MILLING CUTTERS

BY H. M. HUFFMAN • FIELD ENGINEER, THE CINCINNATI MILLING MACHINE CO.

Contour-ground form cutters are designed in three steps—cutter diameter, tooth spacing and the necessary helix angle

PRINCIPLES involved in the milling of plane surfaces with present-day machines and cutters are, in general, pretty well understood and efficiently carried out. But the milling of surfaces involving curves, radii and angles, in various combinations, many times presents problems with which the average shop is not too familiar.

When such shapes have to be milled, first considered should be the selection of the basic method, depending on location, size and complexity of the desired shape. Available methods are use of a form cutter in which the teeth are accurately shaped to the desired profile and the profile method of milling in which the shape is generated by shifting the position of the cutter as the cut progresses, usually under the control of a master templet of some type. As this article deals with form milling cutters, no further consideration will be given to profile milling.

While a large percentage of shaped cuts are made with form milling cutters, probably many more shaped cuts would be employed to advantage if correctly designed form cutters were available and could be easily resharpened. Design of form milling cutters falls into two basic classifications:

1. Form-relieved cutters in which the desired form is carried back into the tooth so continued sharpening on the rake face of the tooth retains the form at the cutting edge.

2. Contour, or profile, ground cutters in which the actual profile of the formed cutting edge is followed in sharpening.

Of the two types, contour-ground cutters, properly designed, offer many distinct advantages from the standpoint of cutting effectiveness and efficiency. Until recently, however, their use has been limited because of the difficulty of resharpening them on conventional cutter-sharpening machines.

The smoothest-functioning cutter for any milling operation is one which will always have at least one tooth in contact with the work. This cannot always be done with standard catalog cutters so it then becomes necessary to design a cutter for the job. The rake angle can be selected to give the most efficient cutting action, and the helix angle can be selected so one tooth will always be in contact, thereby producing a smoothly finished surface.

In contour-ground cutters, each tooth can be provided with the correct clearance angle for the particular material to be milled to improve the cutting action and prolong the life of the cutting edge. This angle can be easily changed if the material is changed or if a change in cutting action is desired.

The values shown in the table are recommended relief and rake angles for various materials when being machined with contour-ground form cutters. These relief angles are recommended in conjunction with a primary land between 1/32 and 1/16 in. wide. If the land is wider than this, the small relief angle may cause the heel of the land to drag on the work.

When designing a contour-ground

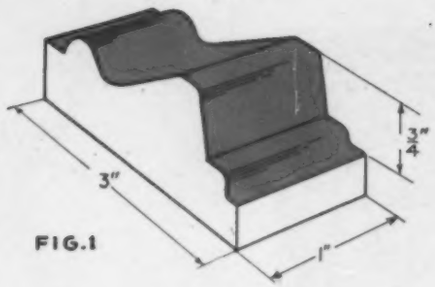


FIG. 1

TYPICAL CONTOUR applicable to form milling is shown here, with a form depth of ¾ in., which influences cutter diameter, tooth spacing and helix angle

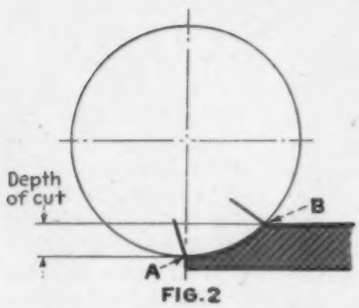


FIG. 2

TOOTH SPACING in a standard milling cut is easily determined because a spacing *AB*, or less, insures at least one tooth in contact with the work

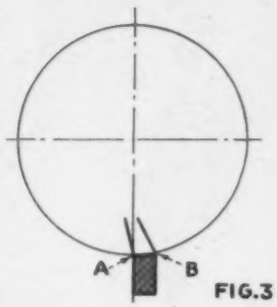


FIG. 3

SHORT CUTS, as from *A* to *B*, would require too close tooth spacing, so the condition must be corrected by using helical teeth on the cutter

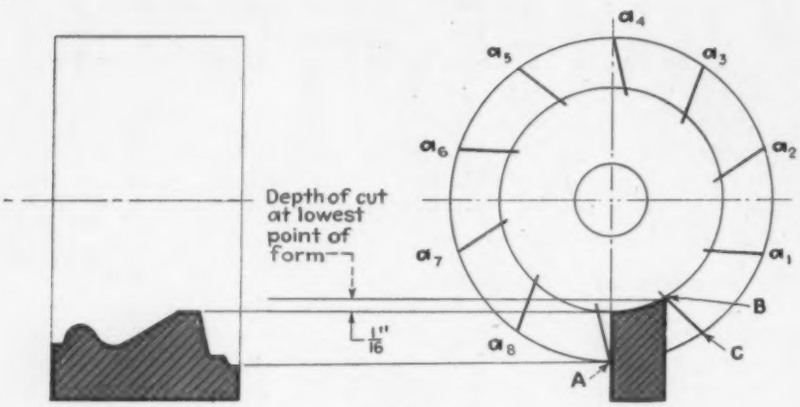


FIG. 4

FORM CUTTERS, as contrasted to standard cutters, require consideration of varying radii, making the actual tooth spacing in this case *AC*

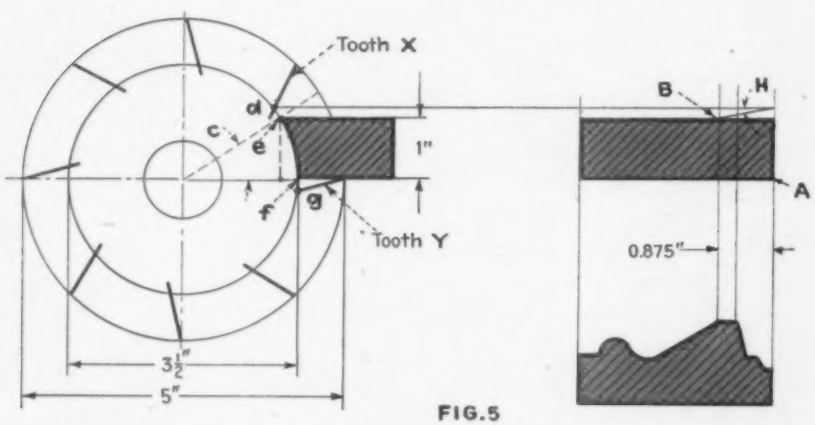


FIG. 5

HELIX ANGLE *H*, required to keep tooth *X* in contact with the work until tooth *Y* is engaged, is calculated from dimension 0.875 in. and length of arc *de* and then converted to lead in inches

cutter for a specific job, the values of rake angle for the material being milled should be kept in mind as well as several other factors including depth, width and length of cut, cutter diameter and tooth spacing. With these facts known, the helix angle or lead can be determined so one tooth will always be in contact with the work.

To illustrate cutter design, it can be assumed that a part as shown in Fig. 1 is required, where the surface to be milled is indicated in color.

Cutter diameter is a function of arbor size, form depth and the arbor clearance required by the nature of the part being milled or the clamps that hold the part. For a part as shown here, an arbor at least 1½ in. in diameter is recommended to provide a rigid cutter support. The design of this part does not necessitate additional clearance for the arbor, so the only other influential factor is the depth of form, in this case ¾ in.

The minimum cutter diameter is obtained from the formula:

$$D_c = 2\,D + D_a$$

in which D_c = cutter dia.
D = form depth
D_a = arbor-collar dia.

As the diameter of the arbor collar for a 1½-in. dia. arbor is 2⅛ in., this value can be substituted in the above equation: $D_c = 2 \times \frac{3}{4} + 2\frac{1}{8} = 3\frac{5}{8}$ in.

This equation obviously does not take into consideration the necessity for a chip gullet at the lowest point of the form or the extra stock necessary for repeated sharpenings which, on this type, are done on the O.D. The formula for cutter diameter can now be altered to:

$$D_c = 2\,(D + D_g + W) + D_a$$

in which D_g = depth of chip gullet
W = Extra stock for cutter wear

A depth of ¼ in. for the gullet at the lowest point on the form should be sufficient and ½ in. of extra stock for repeated sharpenings will give a satisfactory life. These values substituted then give:

$$D_c = 2\,(\tfrac{3}{4} + \tfrac{1}{4} + \tfrac{1}{2}) + 2\tfrac{1}{8} = 5\tfrac{1}{8} \text{ in.}$$

To standardize to some extent, a diameter of 5 in. should be selected. This reduction merely decreases the amount of extra stock by 1/16 in. on the radius.

The two remaining features of

design are number of teeth and helix angle. These features can be varied in conjunction with each other to maintain tooth contact; that is, a close tooth spacing with a low helix angle will result in the same tooth contact as a wide tooth spacing with a high helix angle. On most cutters a wide tooth spacing is recommended for four reasons:

1. It makes a large tooth gullet possible, with more space to accommodate the curled chip.

2. It is possible to provide more substantial backing for the cutting edge and increase the tooth strength.

3. The chip per tooth is greater, hereby assuring more efficient metal removal.

4. The cutter is easily sharpened.

For the standard milling cut, Fig. 2, the tooth spacing is easily determined from a simple analysis of the job. If the spacing is from point *A* to point *B*, one tooth will always be in contact because as the one tooth is leaving the work the following tooth is just entering.

If the length of cut is short, however, as in Fig. 3, tooth spacing, from this same analysis, would be too close. This condition can be corrected and adequate tooth spacing still maintained by employing helical teeth.

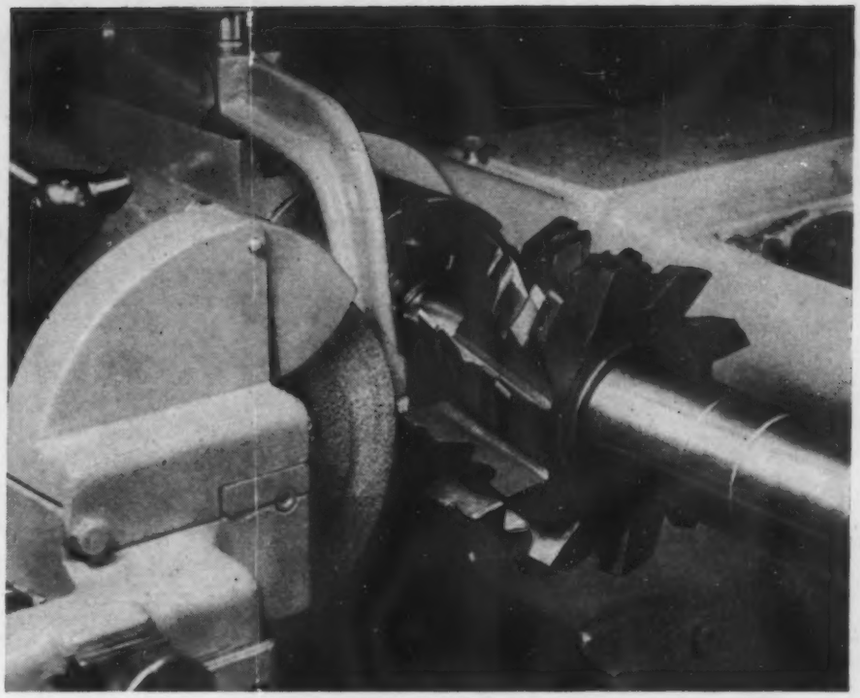
In form cutters it is necessary to consider the varying radii at which the cutting action takes place. Differences in radii between the highest and lowest portions of deeply formed teeth has a marked effect on the tooth spacing, as in Fig. 4.

In this case the initial point of contact of tooth with work occurs at the high point, or maximum radius, of the tooth, whereas the final point of contact has moved back to the lowest point, or minimum radius, of the tooth. The tooth spacing would therefore be from *A* to *C*, considerably greater than if only the major diameter were considered.

If this spacing, from *A* to *C*, is projected around the periphery of the cutter as shown by points a_1 to a_8, it can be determined that the cutter will have nine and a fraction teeth. To provide wide tooth spacing and keep an even number of teeth, it is recommended that eight teeth be used.

RELIEF ANGLES FOR CONTOUR-GROUND CUTTERS

MATERIAL	RELIEF ANGLE IN DEG.	RAKE ANGLE IN DEG.
Alloy steel	2—3	10—15
Mild steel	3—4	10
Cast iron	3—5	5
Brass	3—4	0
Bronze (hard)	2—4	5
Aluminum	6—10	15—20



First tooth of the contour-ground cutter is centered by a centering gage on the workhead. Relief is obtained by lowering wheel center

The analysis is now at the stage indicated in Fig. 5, which shows that a helix angle is required to maintain tooth contact with the work. This angle will be that necessary to keep a point on tooth *X* in contact with the work until a point on tooth *Y* contacts the work. When the correct helix angle is determined, the initial point of contact will be at point *A* and the final point will be at *B*. Therefore, the necessary helix angle, where *H* is the helix angle and *de* is the arc distance from point d to point e, can be determined as follows:

$$\tan H = \frac{de}{0.875}$$

$$de = dg - ef - fg$$

$$dg = \frac{3.5 \times \pi}{8} = 1.374 \text{ in.}$$

$$ef = 3.5 \times \pi \times \frac{C}{360}$$

$$\sin C = \frac{1}{1.75}; \quad C = 34.90°$$

$$ef = \frac{3.5 \times \pi \times 34.9}{360} = 1.064 \text{ in.}$$

$$fg = 0.750 \times \tan \text{ rake angle}$$
$$= 0.750 \times \tan 10° = 0.1321 \text{ in.}$$

Thus: $de = 1.374 - 1.062 - 0.1321$
$= 0.180$ in.

$$\tan H = \frac{0.180}{0.875}; \quad H = 11°37'$$

As milling or grinding the tooth gullets usually requires the helix angle to be stated as a certain lead, it is necessary to convert *H* to a lead in inches:

$$L = D \cot H$$

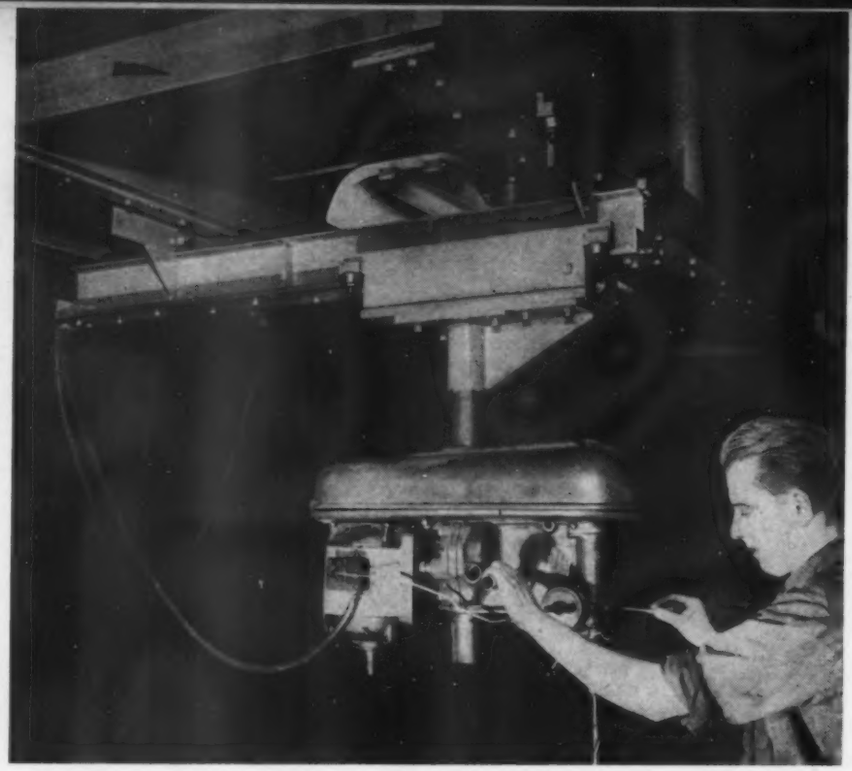
in which L = lead
D = cutter O.D.
H = helix angle

$$L = 5 \cot 11°37' = 76.2 \text{ in.}$$

For original manufacture and subsequent sharpening by grinding the contour, it is expedient to have a lead of some easily obtained value such as 40, 60, 80 or 100 in. As the above calculation does not consider or provide for any tooth contact overlap on the work, a lead of 60 in. should be used.

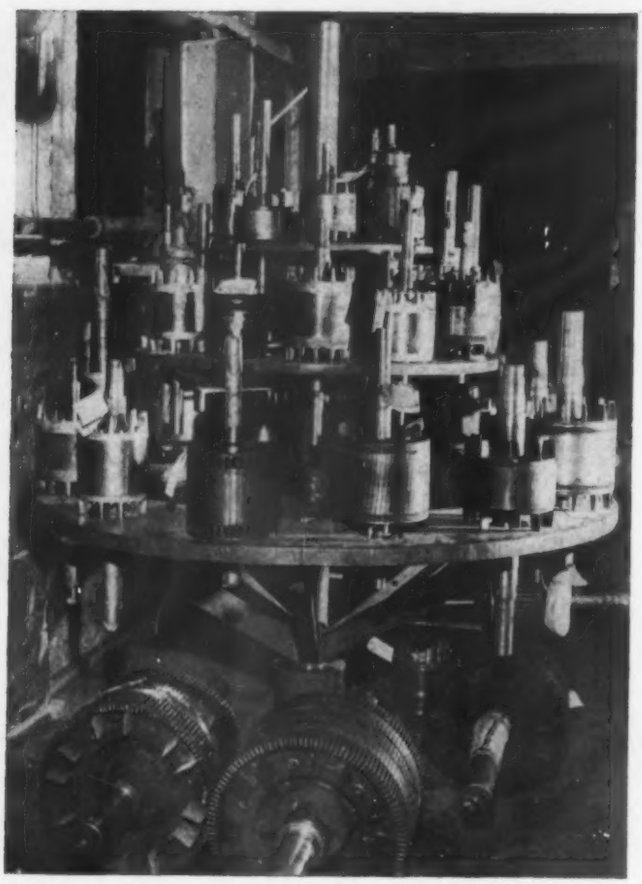
Obviously, if the 80-in. lead were used, the tooth contact with the work could not be maintained.

Form cutters, designed according to the foregoing recommendations, will show better performance in several ways: (1) improved finish on the work, (2) higher production through the utilization of higher feed rate, (3) less chance of cutter breakage under cut, (4) more pieces per grind and consequently longer cutter life and (5) smooth power flow through the machine.

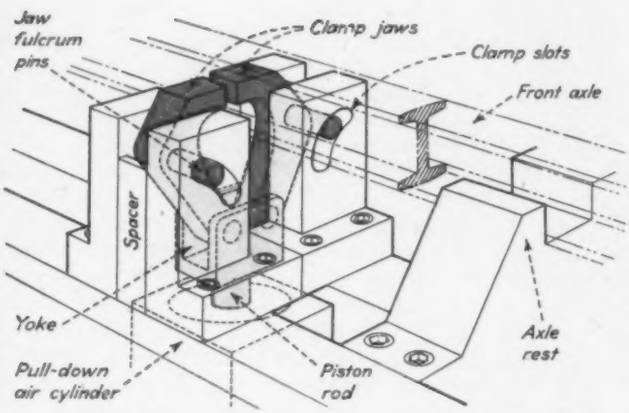


CRANE-SUSPENDED DRILL.. Small bridge-crane structure permits forward, backward and lateral positioning of conventional Delta drill-press head; speeds templet drilling of flat surfaces, such as electrical panel-boards. Rectangular supporting frame is made of 6-in. I-beams; has steel plate "rails" on which 5-in. I-beam bridge travels. Bridge-carriage plate assemblies each have six 1¾-in. ball-bearing wheels (two ride on top of rails, others prevent sway). The crane trolley has similar anti-sway design. Eccentric shoulder bolts provide anti-sway bearing adjustments. The drill post, a 3½-in. pipe bolted to carriage, has a keyway for adjustment rack. Back and forth travel is 48 in.; full lateral travel of bridge, 120 in. *Kirkhof Electric Co., Grand Rapids*

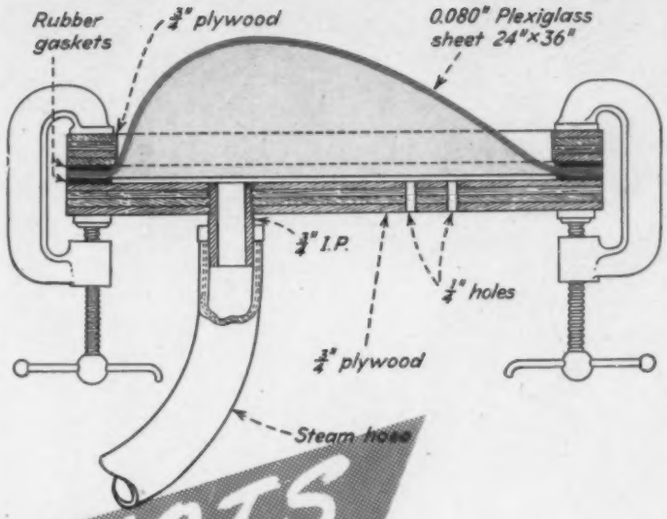
SHOP



ROTOR STORAGE TURNTABLE.. Special triple-deck platform features space conservation and accessibility. Revolving on center-pipe sleeve pedestal, it holds 32 rotors from 20 hp. down, carries 4 tons, is 84 in. high, covers less than 31 sq.ft. of floor area and has net weight of 1,600 lb. Welded channel-iron "spokes" support three wood decks (66-, 42-, 24-in. dia.) at 33-, 48½-, and 60-in. heights. The lower deck has twelve 4-in. holes, center deck twelve 3-in. holes, and top deck eight 2-in. holes to accommodate shafts of rotors standing on end. *Spaulding Electric Company.*



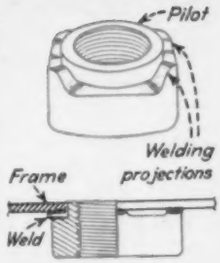
AXLE-ASSEMBLY CLAMP.. At the Highland Park Plant, four different sizes of axles are handled on the truck-assembly line. This has made it necessary to develop fixtures which are universal in their application, because the subassembly material flows in at the same station on the assembly line, irrespective of the model chassis being put together. There are two primary axle-assembly stations—one where the steering knuckles and tie rod are put in place and the second where the wheel hubs and brake drums are installed. In both cases, the axle center or bed, which is of I-beam section, is rigidly held in a vise-like fixture that must take four different sizes and hold them securely. These fixtures are operated by a single air cylinder. By use of cam slots, clamping jaws are made to fit all sizes of I-beam sections and then to pull the axle bed down securely in the rests at each end. This makes it possible quickly to secure axle, while operations on its ends are being made, and then as rapidly to release it. *Ford Motor Co.*



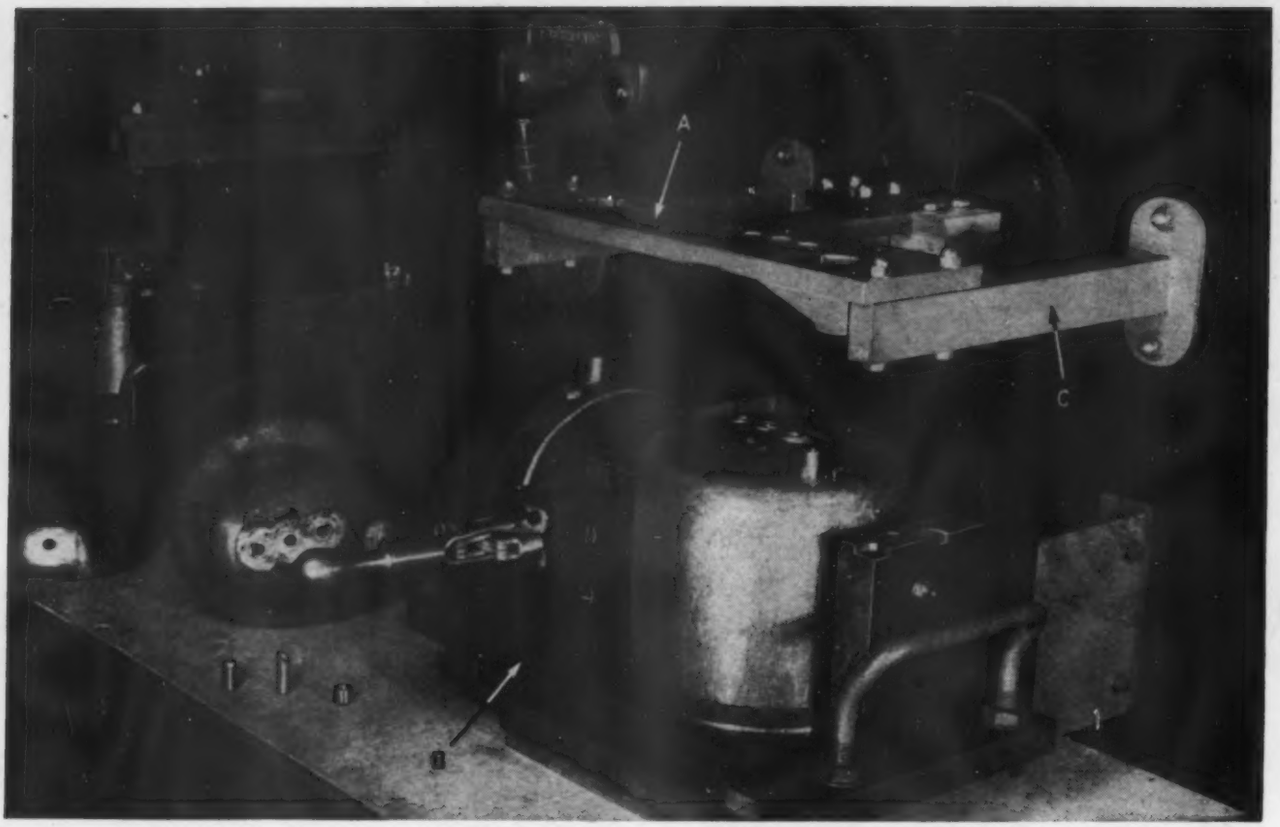
SHOTS

BLOWING PLASTIC BUBBLES.. Recently some Detroit mechanics who are building gliders, were confronted with the problem of making a few Plexiglas bubbles for the pilot canopy. They tried numerous methods, such as heating the material in an oven and then trying to form it over a mold. Finally they connected a water tap to a plywood frame by an iron pipe and hose. The top frame was cut out to the shape of the bubble base and made symmetrical about the center line. Its inside edge was given a good radius where the Plexiglas formed over it. The bottom plywood piece had the iron pipe fitting and also two ¼-in. outlet holes. Rubber gaskets above and below the plastic sheet acted as a seal when the two plywood pieces were clamped together with C clamps. The bubbles were made by getting up steam in a hot-water boiler, turning on the hot-water tap and allowing the steam to escape under the Plexiglas sheet. The steam heated the Plexiglas sufficiently to make it plastic, the pressure being controlled by the tap. When the steam is used up, hot water expands the bubble.

TAPPING STAINLESS STEEL.. These wrist-watch cases of stainless steel require a special thread—42 pitch, 90° and 1.132-in. dia.—comparable to a class 3 thread fit. Tapped on a No. 12 Warner & Swasey precision tapping and threading unit, an accurate fixture and depth control are needed to bottom tap the two 42-pitch threads at three pieces per min. Operator, through a linkage mechanism, positions the collapsible chuck with the left pedal and, with the other pedal, controls air-operated chuck jaws for loading and unloading. *Keystone Watch-Case Div., Riverside Metal Co.*

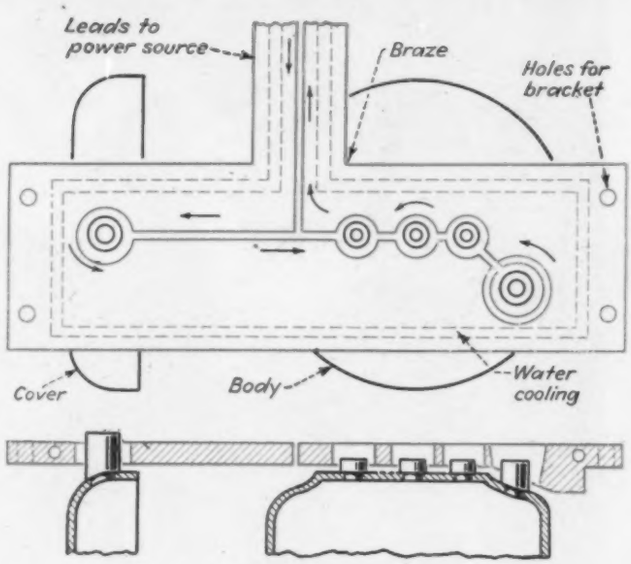


WELDING FRAME NUTS.. Fastening units to truck frames expedites line assembly where power tools are used to drive bolts and nuts. When bodies, steering gear and other equipment are attached to the frame, it is often difficult to reach the nut, particularly if one man must do the job. Projection welding the nut in the frame siderail or flange makes it a one-man job of bolting parts together. It also makes field service work easier. Holes are punched for the nuts which have a pilot that fits the hole. Four projections, forged on the nut body, butt against the frame when the nut is in place. The nut is positioned in the lower die of the platen of a 100 kva. Progressive press-welder. The frame rail is slid into place over the nut, and the upper platen brought down against it. One shot of current fuses the nut projections to the side rail. *Midland Steel Products Co., Detroit*



SILVER-BRAZING BUSHINGS.. A solid, multiple-position coil (A), supported from the table front panel by brackets (C), silver-brazes bushings (left foreground) to a sheet-metal housing and cover (far left). Cover and housing are placed in holding fixture B, as shown, then the latter is raised by air cylinder to position surfaces to be heated within the coil. A transfer switch on the two-position table permits one station to be loaded while the other is heating

COIL DESIGN.. Copper plate, ⅜ in. thick, with bus leads, forms the coil. Hole openings, positioned to suit bushing location on the work, provide inductance. Slots 1/16 in. wide cut between openings force current flow in series (arrows). Cooling-water channels around the plate are provided by drilling connecting holes 5/32 to ¼ in. in dia. and plugging their ends to form a loop. Over-all coil size is not important because the h.f. current flows only on inner surfaces; the plate should be large enough to permit cooling passages and to provide connections for brackets or other supports



Section Through Heating Area

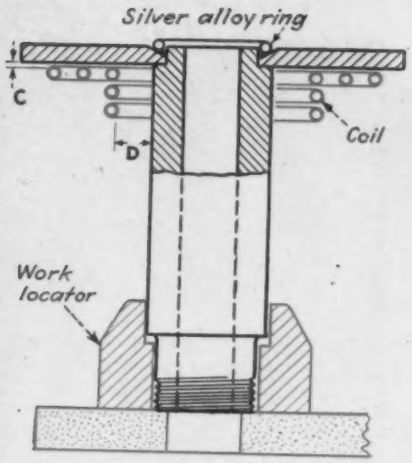
MULTIPLE-POSITION COILS SPEED INDUCTION HEATING

BY FRANK W. CURTIS, INDUCTION HEATING CORPORATON

MULTIPLE-POSITION coils for high-frequency induction heating can be built up to suit the work to be treated. Basically, there are two distinct designs:

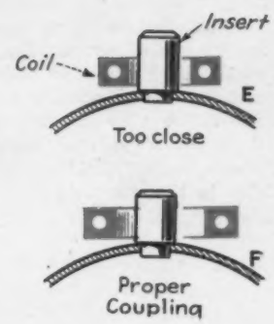
1. Solid-type inductors of bus bar.
2. Multi-turn coils for tubing.

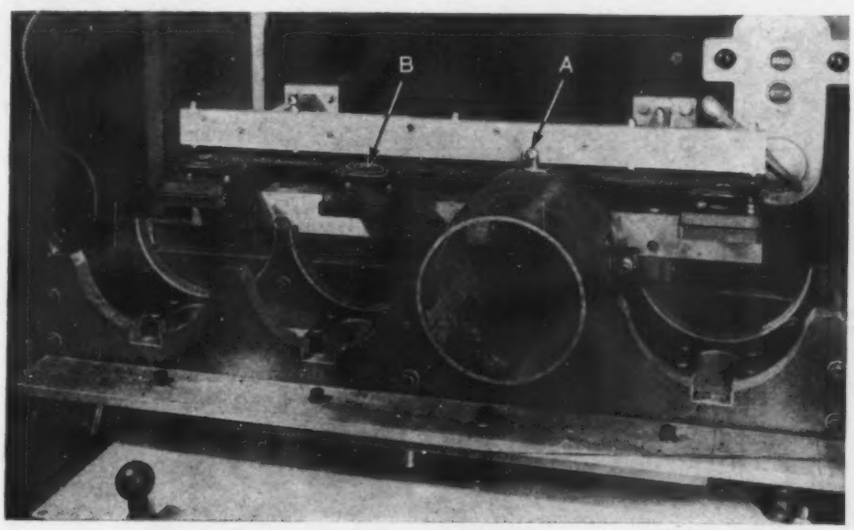
Choice depends on the application; *solid types,* classed as single-turn



FLANGE AND HUB ASSEMBLY.. A steel flange and hub assembly (*right*) is brazed in a multi-turn coil supported by arms (*A*) for stiffness. Supports are attached to outer surfaces of the coil so they do not affect current flow. A locating plate (not shown) under the coil aligns the work, and a two-position table provides heating in one coil while the other is loaded. In this case the flange is ¼ x 6¼ in., the hub is necked to 1 9/16 in. at the joint and has a ⅞-in. bore

COIL DESIGN.. The coil, as at top right, is a combination cylindrical and pancake type arranged to provide close coupling at the flange (*C*), with somewhat looser coupling around the hub (*D*). Metal placed directly within a coil heats much faster than if placed on top or adjacent to it, therefore the differential in coil coupling is required to assure uniform heating of components. This is true even with single-turn coils, as sketched at right. At *E* the coil will overheat the insert before the sheet-metal body below reaches brazing temperature. Increasing the coupling around the insert and setting the coil close to the body, as at *F*, makes heat rise uniform in both parts





TUBE CONNECTORS.. Right-angle tube connectors (*A*) are brazed to rolled-steel compressor housings in this 4-position setup. Multi-turn pancake coils (*B*) are formed to conform to housing curvatures, and are fed and supported by a bus. Studs brazed to under surfaces of coil-turns also support it from a plastic plate beneath. Work is merely placed over the coil in a cradle fixture. End location is by means of plastic plates

coils, are usually used where the desired band of heat is narrow, while *multi-turn* designs are applied where a wider or longer area is to be heated, for example where the length of heated surface exceeds half the diameter of the inside coil opening. Multi-turn coils also are preferable for non-ferrous metal heating.

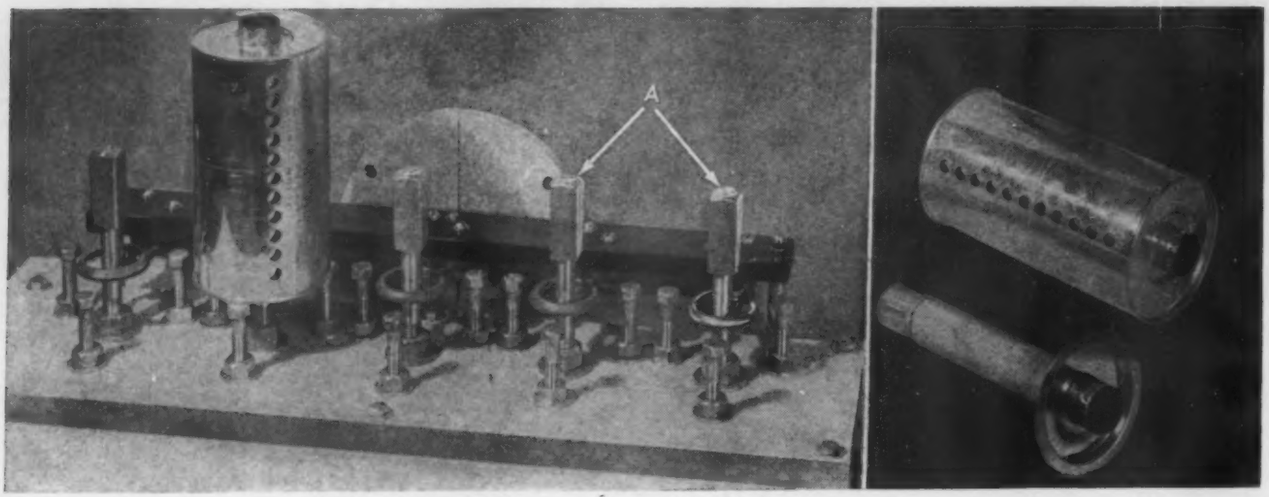
Multiple-position coils have basic common requirements, which are:

1. Copper must be used for their construction.
2. They must be series-connected.
3. Cooling must be adequate.

Copper has superior conductivity to other metals. Series design is necessary to insure current flow in all coil positions. High-frequency current follows the path of least impedance, so if a parallel hookup were used, current would flow only in one coil section. Water circulation throughout the coil assembly is required, as in any induction-heating coil, to prevent self-heating.

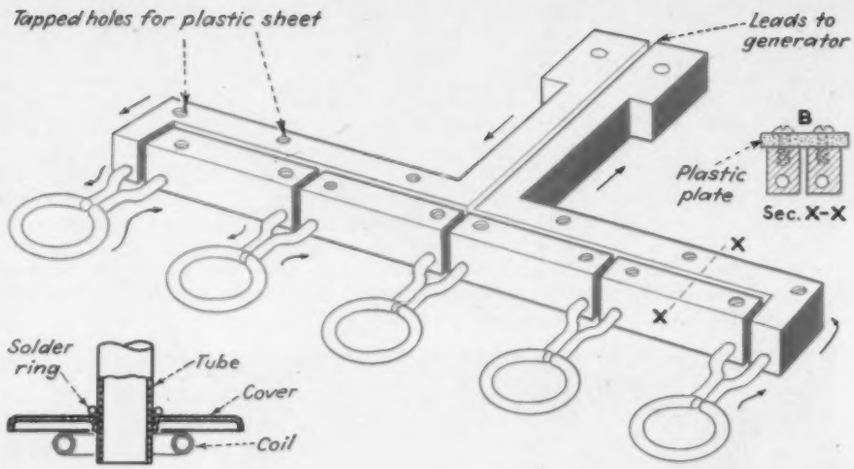
Some typical coil arrangements are shown in accompanying photos and sketches (next spread also).

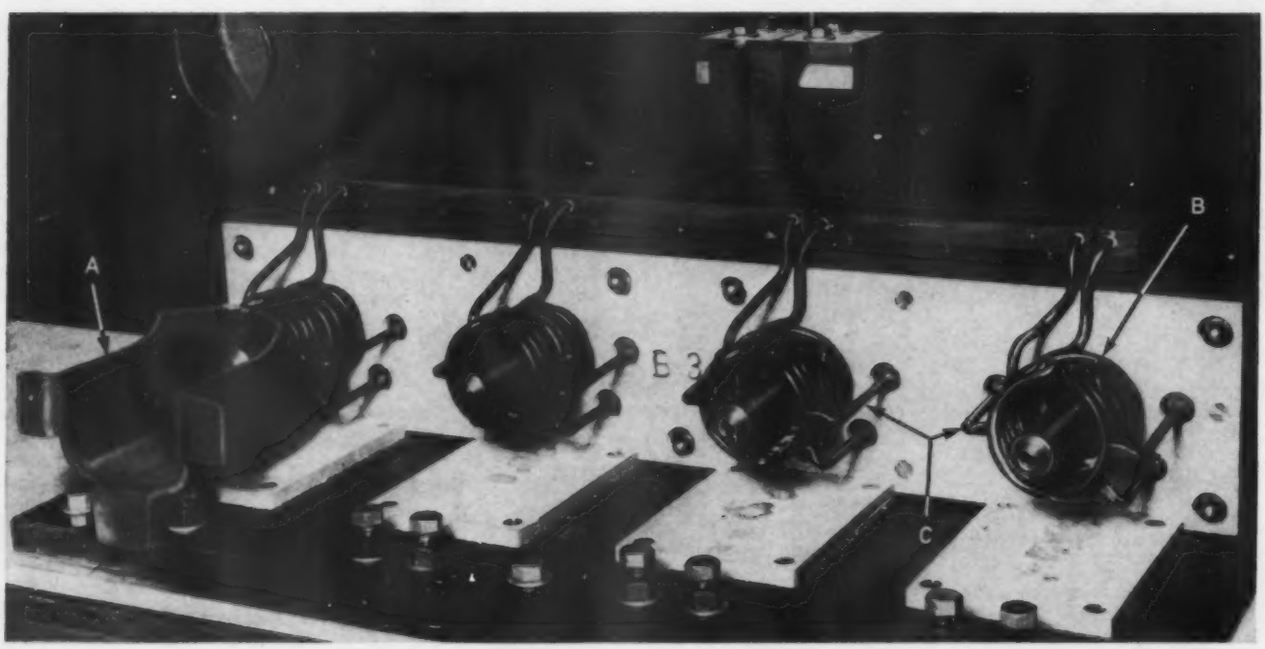
• BOTH SOLID AND MULTI-TURN INDUCTION HEATERS ARE DESCRIBED IN THIS



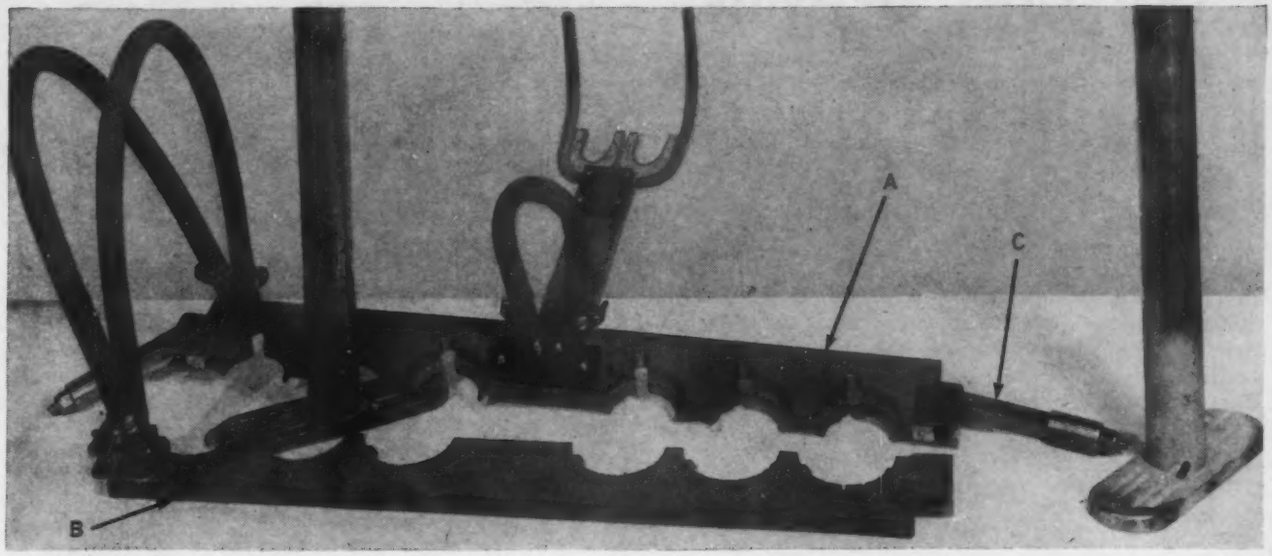
CAN ASSEMBLY.. A 5-position coil solders a canister assembly consisting of body, tube and cover (far right). Brass studs (*A*) within the coils locate the work centrally within the coil. Studs are reduced in diameter around the coil to minimize heat absorption. Three bolts, set around the base, are adjustable in their nuts to support the assembly

COIL DESIGN.. The coil frame is sections of copper bus tied together with a plastic plate, as at *B*. Five single-turn coils are brazed between front sides of bus sections so current flow is in series (arrows). This construction provides coil rigidity and is widely adaptable

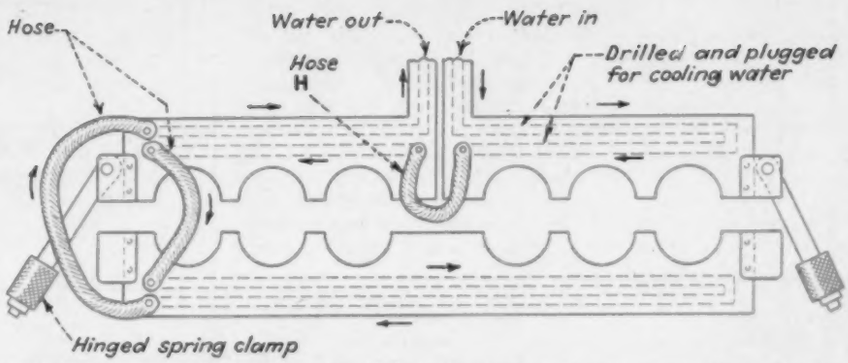




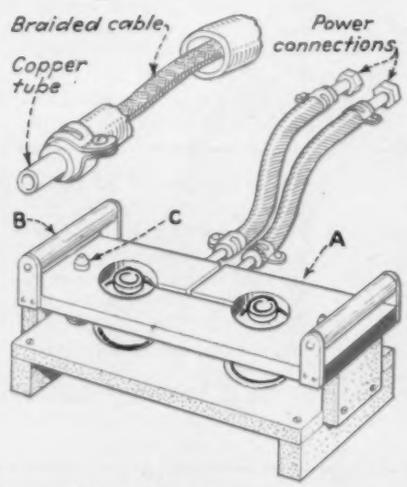
SPINDLE BRAZING.. Bus construction provides support for these four series-type multi-turn coils for brazing a spindle to a heavy plate body (*A*). Coils (*B*) are of pancake design, formed cylindrically to surround the part of the work to be heated. Brass-rod braces (*C*) also provide coil rigidity. Studs position the work



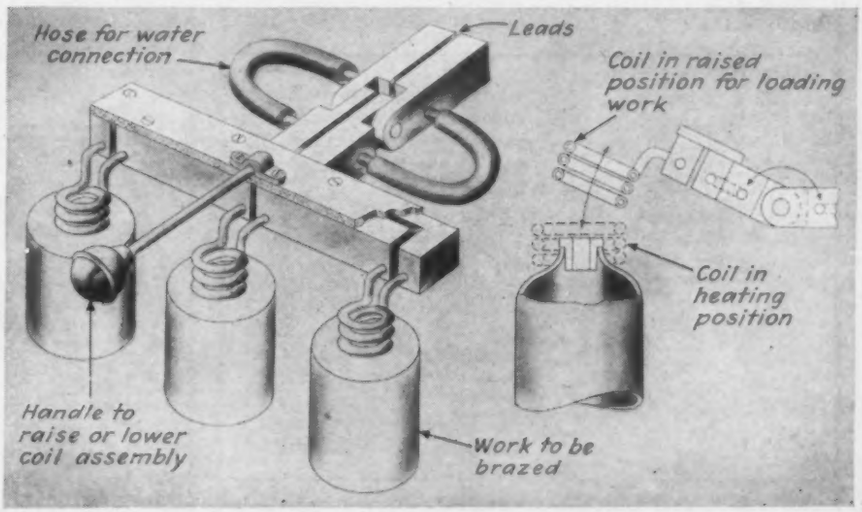
TWO-PIECE COIL.. To facilitate work loading, coils may be in two parts. This one brazes six foot plates and valves to tire-pump barrels at once. Rear section *A* is mounted solidly to the fixture. Removable front section *B* is attached to *A* by two hinged spring clamps *C*. Work is held in nest plates (not shown). If the coil were not split, work would have to be fed up awkwardly from below



WATER CIRCULATION.. Both parts of a two-piece coil must have cooling water circulating in all sections. Because the rear section is actually two pieces, water enters through the right-hand lead, flows through drilled openings to the other end and back, then through hose *H* to the left-hand section. At the outer end of the section, however, it passes through a hose to the outer-coil loop before it returns through another hose to the return passage to the left-hand exit. This system can be adapted to coils with more than two sections also



REMOVABLE COIL.. Occasionally, a removable coil with flexible leads can be used. Here a two-position solid inductor (*A*) has twin handles (*B*) so it can be lifted off the Transite (to avoid shorting) fixture base and supports. Guide pins (C) position the coil. Flexible leads are of heavy-duty hose (carrying cooling water) through which a braided copper cable carries the h.f. current. This design can also be used with multi-turn coils with bus-lead construction, mounted on a plastic or other non-metallic plate


Hose for water connection
Leads
Coil in raised position for loading work
Coil in heating position
Handle to raise or lower coil assembly
Work to be brazed

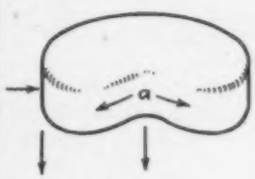
BUSHING BRAZING.. When it is not convenient to elevate work into the coil, a hinged coil may be used. This three-position setup brazes a bushing to a drawn-steel body. Multi-turn coils are supported by bus construction, in which the hinge is incorporated. Cooling water is carried around the hinge by hoses. The same principle can be used for solid inductors

PRACTICAL DESIGN OF THIN-METAL STAMPINGS..2

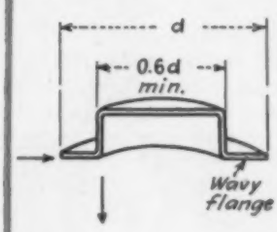
BY WALLACE C. MILLS, ROCKFORD, ILL.

IN PART 1, drawing practice, decorating and industrial-design requirements were shown to affect structural design of thin-metal stampings. But to make structural designs possible and easy to manufacture demands more than an acknowledgment of these factors. It demands application of know-how—of what to do and what not to do. Study of the following sketches will indicate to the designer the right-of-way to successful structures and practicable production. Poor designs are shown to indicate the pitfalls that the successful designer avoids.

DESIGN HINTS ON DRAWN SHELLS



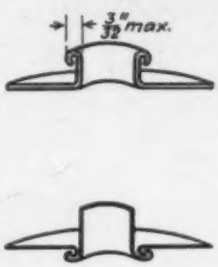
Reentrant Curves—The metal is worked in compression laterally and in tension vertically at all points on the periphery, except at the reentrant curve *a* where it is in tension in both directions. This design should be avoided as much as possible for thin metal, but can be used for shallow draws and gentle curves

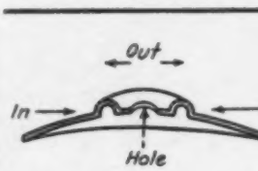


Hat-shaped Structures—The flange (first draw) has not been drawn all the way down. Horizontal flange, in compression and tension combined, tends to buckle because of compressive forces set up when the metal draws in from a larger to a smaller diameter and is likely to be wavy and not lie flat

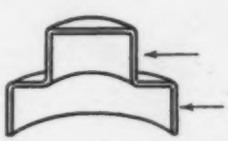
Redrawing—The second draw should be made by reforming the metal in the hub of the first draw without reducing diameter *d*. Wrinkles show at *b* which is hub diameter after first draw and at each successive redrawing diameter. Corner radius *r* should be the same as the best radius of the drawing punch for drawing thin metal, about 5/64 in. for best results to avoid tearing and puckering

Interior Flanges—Plain interior flange is formed by drawing a small hub in several operations and cutting out the bottom of the hub, or by drawing a hub with a hole in the center and straightening the flange. A curled interior flange is difficult to make because the metal must be stretched to form the curl and may rupture. As an alternative to a one-piece, interior-flanged structure, pieced construction is better because of the many operations required for drawing an integral hub and the possible wavy flange



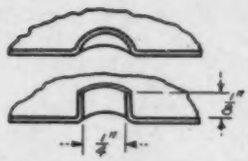


Directional Metal Flow—The center hole in this piece helps the drawing operation, because the metal can, to a limited extent, draw outward from the hole boundaries, as well as inward

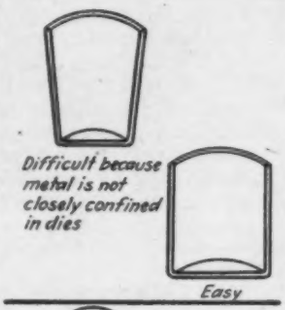


Two-diameter Cups—Cups having two diameters are not difficult to form, because the metal is worked in compression laterally. They are not like reentrant curves, where the metal is in tension both laterally and vertically. Two operations are needed to avoid wrinkling of the metal

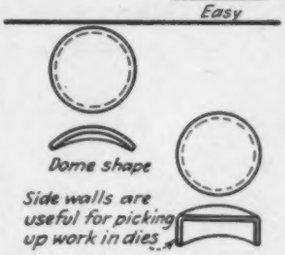
Stepped Hubs—Hubs of multiple diameter can be made by reforming the metal in the rounded corner of a cup without undue stretching or compression, or they can be formed by successive redrawing operations. Bullet-shaped structures can be made from the stepped structure by smashing the metal down hard between dies to remove steps

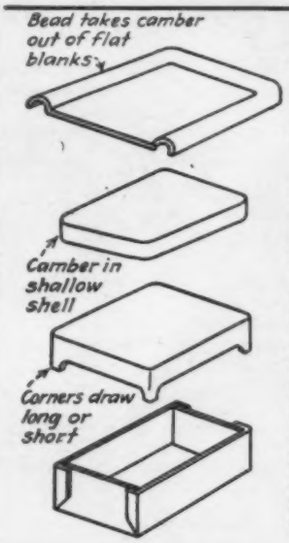


Small Hubs—A small hub ¼ in. in dia. × ⅛ in. high can be made by first stretching a ball-shaped depression, then perforating and forming in another operation



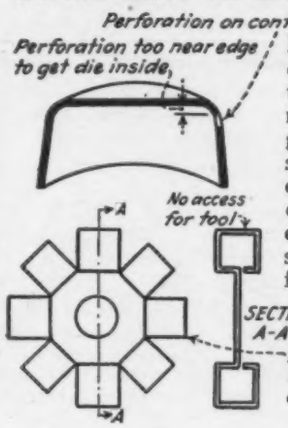
Tapered Shells—Tapered shapes are more difficult to draw without wrinkling than straight-walled cups, because the metal is not closely confined between punch and die. Also, straight-walled cups are easier to make than dome shapes without the side walls, because they may be blanked and drawn and the cup picked up by clinging inside the punch. It is knocked out at the top of the stroke and ejected by compressed air. The dome shape can be embossed in one stage of a progressive die. The stamping is blanked and pushed through in a second station



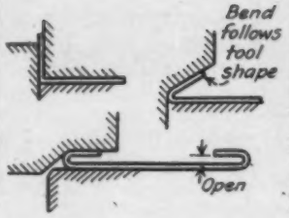


Drawn Rectangular Shells—Flat blanks have camber according to the twist in the material before blanking, unless blank edges are beaded or curled. Shallow rectangular shells have camber because the metal is drawn in the closed end. The twist can be taken out by curling the edge in another operation or by forcing some of the side-wall metal back into the closed end to relieve the tension. Preferred alternatives to sharp corners are seamed corners, notched and folded corners or pieced construction

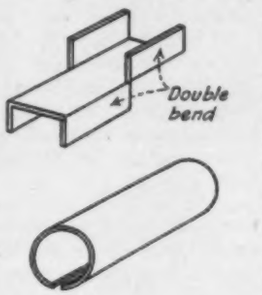
DESIGN HINTS ON MISCELLANEOUS PARTS


Perforation on contour
Perforation too near edge to get die inside
No access for tool
A
SECTION A-A
Delicate tools required because of sharp points on blank

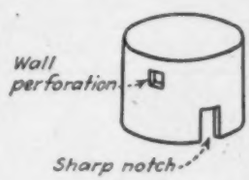
Perforating—Designs calling either for delicate tools or for tools that must be sharpened by grinding to a contour should be avoided. Flat dies can be sharpened easier. To form a well-defined shape, forming should be over a hard tool for which access is provided



Bending—Bending can be done in successive stages by bending the metal a little at a time with the tools shaped for successive bends. Forming such bends and curves in thin metal is easier than in heavier stock, because the metal bends so easily

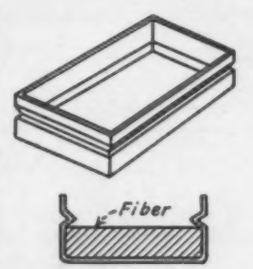


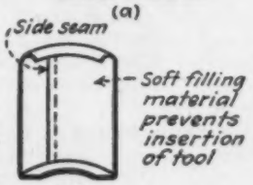
Bending against Spring Pressure—The part with double bend can be bent in one operation by forming downward over a pressure pad supported on springs, then pressing the blank and pressure pad down into the die while making the other bend upward. The cylinder can be formed by pressing the blank down over an arbor and forcing the arbor down into the die

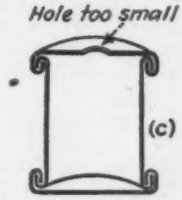


Notch Distortion—Sidewall perforations and well-defined notches must be made, in additional operations, after drawing. If made before, the holes tend to close up because of compression

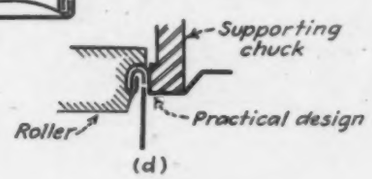
POOR DESIGNS

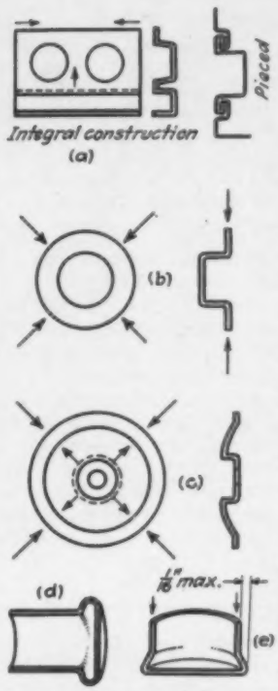




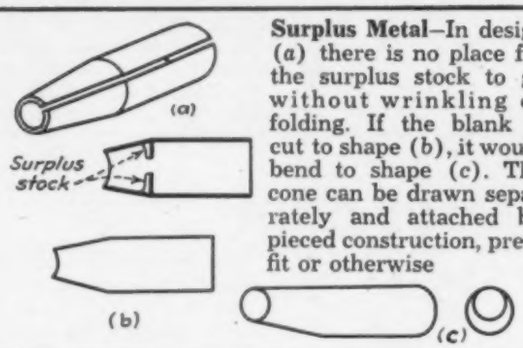


Tool Access—Designs are impractical when a tool cannot be put inside to form against. To assemble fiber or other soft material in a drawn shell (*a*) and then form an inward bead to hold it in place requires a hard tool inside to form a well defined groove. Tool access also is impossible when a sleeve (*b*) is filled with soft material. The sleeve can be turned in at top, but it will have wrinkles as there is no hard tool inside to bump it. Bottom end can be bumped over a hard plug before filling, but if bottom flange is too wide, stock gathers in wrinkles. Small opening (*c*) also prevents tool insertion. Practical design (*d*) provides access for tool into body of part

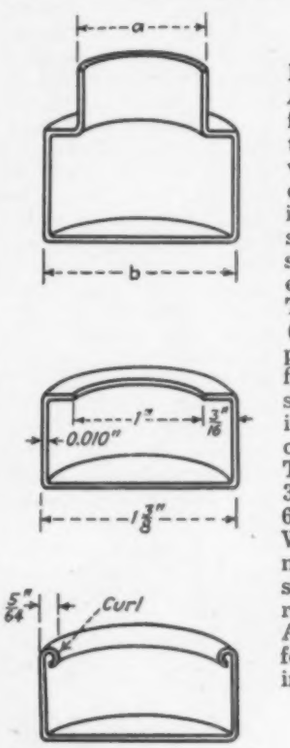




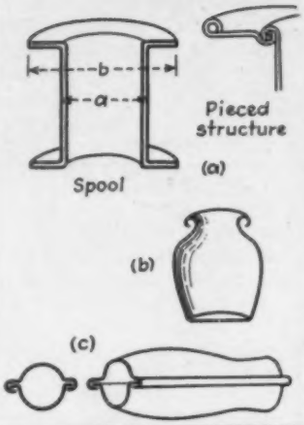
Restricted Metal Flow – Metal in double-cup part (*a*) must draw over two forming punches at the same time. As it would be locked so it would stretch and tear, pieced construction is indicated. Conditions, as in circular shell (*b*), are better when the stock can draw freely from all directions and still better when the draw is near the periphery. Difficult draws (*c*) can be helped by punching a center hole so stock can draw partly from inside, but amount of draw from inside, without tearing, is limited. Rolling a prominent bead (*d*) in the bottom of a deep drawn shell is difficult because the stock cannot draw freely from the open end and not at all from closed end. Design in (*e*) can be formed by end pressure with metal confined



Surplus Metal–In design (*a*) there is no place for the surplus stock to go without wrinkling or folding. If the blank is cut to shape (*b*), it would bend to shape (*c*). The cone can be drawn separately and attached by pieced construction, press fit or otherwise



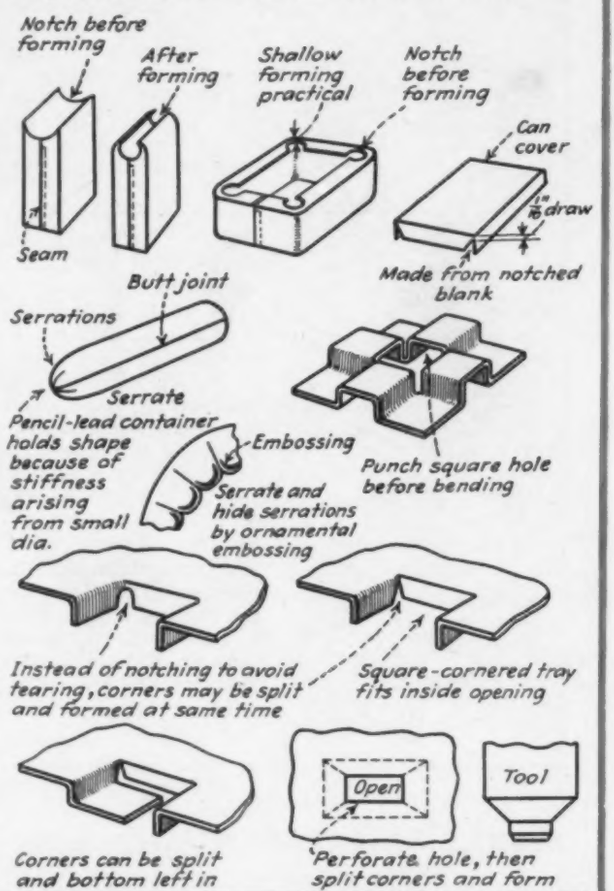
Roll and Die Forming – As in (*a*), shell circumference at *a* is smaller than at *b*, surplus stock would gather at smaller diameter when the shell is rolled or die formed. A slight reduction is possible by reducing diameter in several operations. Turning in edge of shell (*b*) by die forming is not practical because the flange would wrinkle. The shell can be made by rolling in the flange from the outside in three stages. The first roller forms a 30° angle, the second a 60° and the third a 90°. When requirements are not so particular for a straight flange, it can be rolled in one operation. A practical alternative for die forming is shown in (*c*)



Excessive Stretching – Designs in (*a*) and (*b*) are impractical because the metal would tear. Stretching (*a*) from dia. *a* to *b* would rupture thin metal, so pieced structure is indicated. Spools of heavy soft stock can be spun, as can the shape in (*b*), which also can be bulged with rubber or hydraulic dies, but only to a limited extent as thin steel stock would tear easily. Pieced construction in (*c*) is practical for die forming

SUGGESTIONS FOR GOOD DESIGN

Surplus stock can be cut away to avoid wrinkling . . .

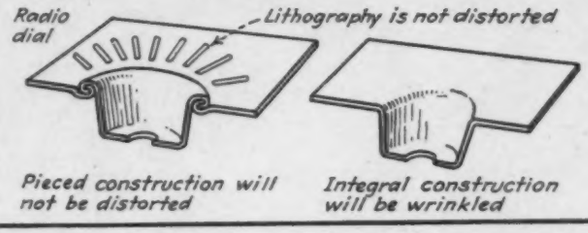

Notch before forming
After forming
Shallow forming practical
Notch before forming
Can cover
1/16" draw
Seam
Made from notched blank
Butt joint
Serrations
Serrate
Pencil-lead container holds shape because of stiffness arising from small dia.
Embossing
Serrate and hide serrations by ornamental embossing
Punch square hole before bending
Instead of notching to avoid tearing, corners may be split and formed at same time
Square-cornered tray fits inside opening
Corners can be split and bottom left in
Open
Tool
Perforate hole, then split corners and form

Surplus stock can be formed intentionally instead of being allowed to go where it will . . .

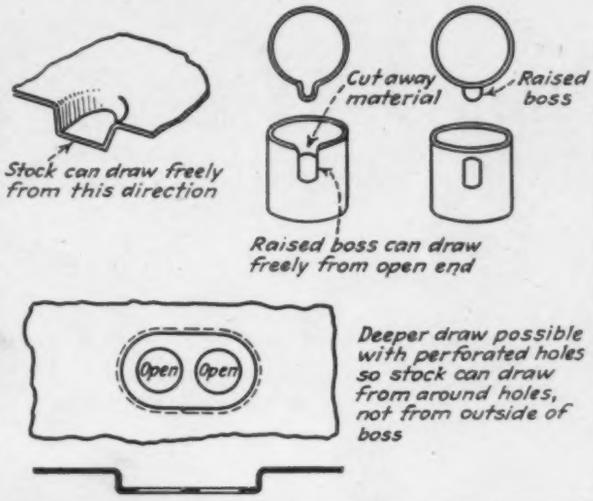
Metal in grooved ash tray is formed to well defined shape here, instead of being allowed to wrinkle.

Other familiar examples
Stove-pipe elbows and eave troughs with corrugated ends
Bead or offset provides convenient stop line for folds, so they are uniform in length

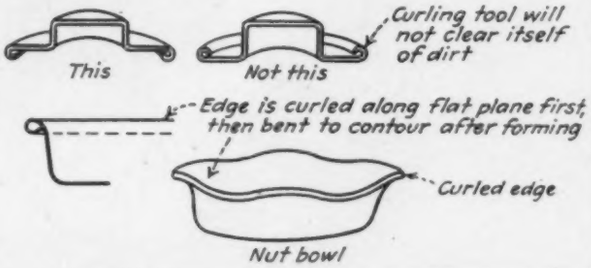
Pieced structures avoid distortion . . .


Radio dial
Lithography is not distorted
Pieced construction will not be distorted
Integral construction will be wrinkled

Forming near edge from which metal can draw freely is less apt to tear stock than forming in the interior . . .

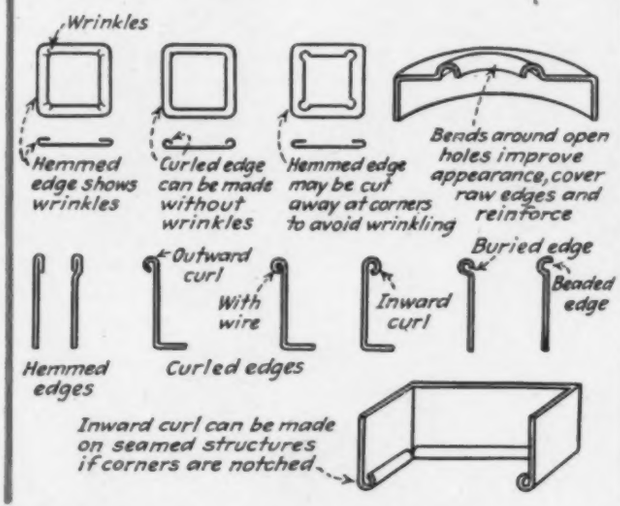

Cut away material
Raised boss
Stock can draw freely from this direction
Raised boss can draw freely from open end
Open
Open
Deeper draw possible with perforated holes so stock can draw from around holes, not from outside of boss

Design can avoid tool troubles . . .

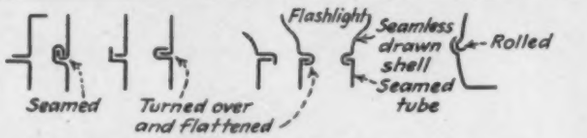

This
Not this
Curling tool will not clear itself of dirt
Edge is curled along flat plane first, then bent to contour after forming
Curled edge
Nut bowl

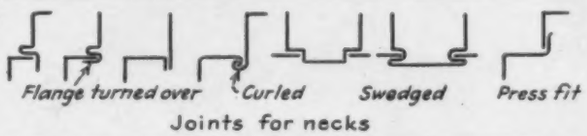
CONSTRUCTION DETAILS

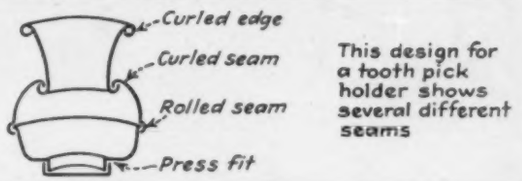
Covering raw edges . . .


Wrinkles
Hemmed edge shows wrinkles
Curled edge can be made without wrinkles
Hemmed edge may be cut away at corners to avoid wrinkling
Bends around open holes improve appearance, cover raw edges and reinforce
Outward curl
With wire
Inward curl
Buried edge
Beaded edge
Hemmed edges
Curled edges
Inward curl can be made on seamed structures if corners are notched

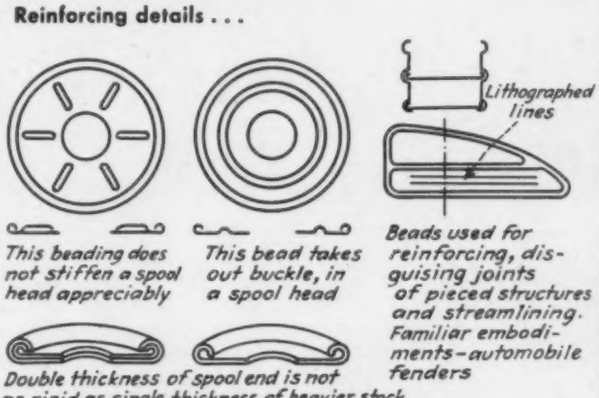
Joints for pieced structures . . .

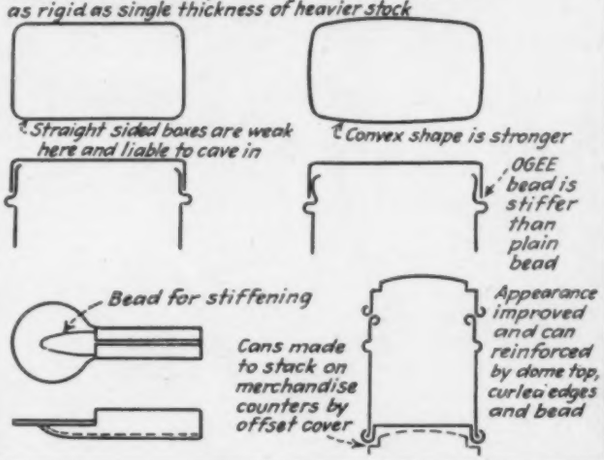


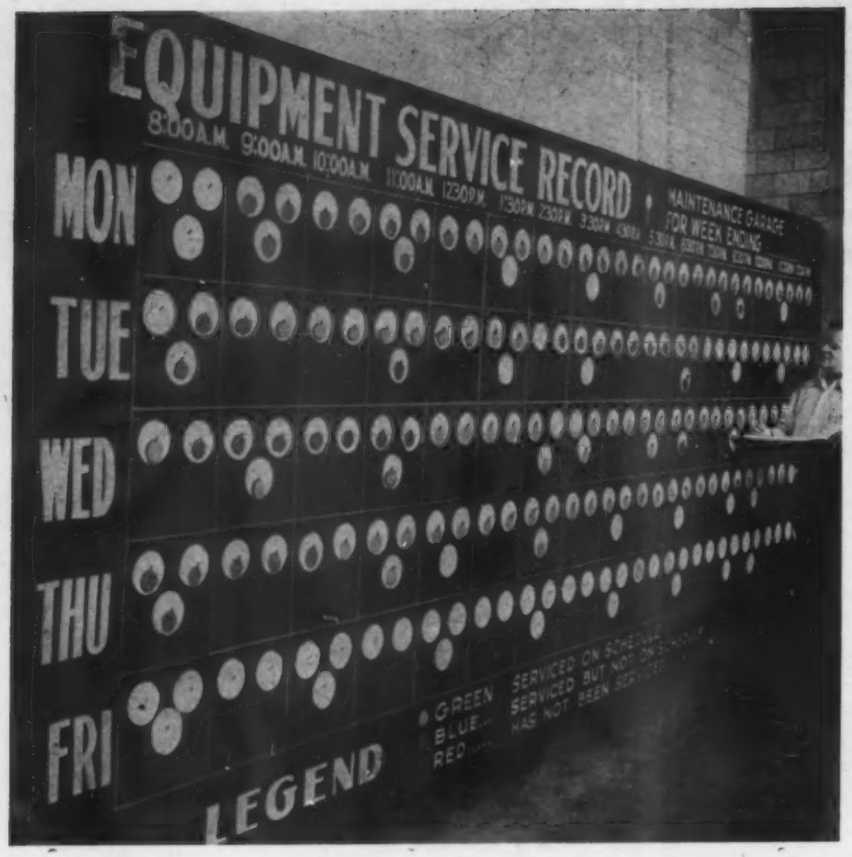




Reinforcing details . . .


Lithographed lines
This beading does not stiffen a spool head appreciably
This bead takes out buckle, in a spool head
Beads used for reinforcing, disguising joints of pieced structures and streamlining. Familiar embodiments–automobile fenders
Double thickness of spool end is not as rigid as single thickness of heavier stock


Straight sided boxes are weak here and liable to cave in
Convex shape is stronger
OGEE bead is stiffer than plain bead
Bead for stiffening
Cans made to stack on merchandise counters by offset cover
Appearance improved and can reinforced by dome top, curled edges and bead



Equipment service record "scoreboards" the preset maintenance program. Each truck is scheduled to day and hour

Handling Organized for Mass Production

BY E. M. ARGERSINGER
Superintendent of Materials Handling
KAISER-FRAZER CORPORATION

Organization of a materials-handling program can make it click—or fail badly. Central control solves many problems

DESIGNED and built for bomber production, Willow Run is now a full-fledged automobile production center—the home of Kaiser-Frazer. K-F occupied its 4,000,000 sq. ft. late in 1945 and installed assembly lines, conveyors and other equipment necessary to produce automobiles. The first car rolled off the first final-assembly line in June, 1946. To keep pace with automobile output, the development and rapid expansion of a comprehensive materials-handling program has been a major task.

K-F's handling problems were somewhat simplified from the outset because all major production operations could be confined to the single-floor main manufacturing building, with no elevators or ramps to impede the flow of vehicular traffic. Furthermore, the plant is served by inside railway and truck shipping docks not subject to vagaries of the weather.

Capitalizing on the large floor area, layout engineers provided wide aisles for inter-departmental traffic and reserved generous, high-ceilinged areas near production lines for part and material storage.

Materials-handling engineers decided that extensive use of industrial trucks was the route to most efficient transportation of production materials not handled by the 17 mi. of power conveyor that wind through the factory. That the over-all handling burden is considerable is evident from the following figures:

1. More than 3,000 widely varying parts and materials are regularly received from suppliers.
2. An average of 28 freight cars and trucks must be unloaded simultaneously, and shipments placed in storage or delivered direct to assembly lines.
3. Approximately 1,500,000 lb. of incoming production material must be handled daily.
4. Thousands of feet of final assembly and processing conveyor must be fed continuously to keep production moving.

To achieve utmost flexibility in routing material and parts, we have built our transportation system around the following power units:

Kind of Equipment	*Number of Units*
Fork trucks	49
Tractor trucks	23
Platform package trucks	4
Lumber carrier	1

Trucks range from 2,000 to 10,000 lb. in capacity and provide a versatile pool of motive power for the variety of jobs which the handling department performs. Makes of equipment, mostly gas-mechanical, include Towmotor, Clark, Hyster, Mercury, Ross, Ferguson and Buda.

Central Dispatching Selected

As materials handling is one of industry's last frontiers for reduction of production costs, considerable care has been taken to set up the most economical routing system.

All equipment and drivers work out of a centrally located plant dispatching office, flanked by a 2,400-sq. ft. "parking lot" where the industrial trucks are parked when not in service. From this strategic zone the dispatcher assigns equipment to such divisions as receiving, body stamping, body-in-white, body trim and chassis for their exclusive use in handling materials for those departments.

Assignment of the number and type of equipment is based on experience averages, and for the most part these assignments are perma-

Tiering racks that save storage space and permit rapid truck handling are adapted to parts not easily palletized. The result—double tiering of 24 door assemblies in 22 sq. ft.

K-F engines are truck-shipped from the engine division, delivered from receiving and stored near the engine-assembly line in 90 × 42-in. tiering racks. Storage area needed—75 × 25 ft. for each 576 engines or 144 racks

nent. Thus, drivers asssigned to certain departmental "runs" pick up their trucks and report direct to their respective jobs at the beginning of each shift unless other orders are issued by the dispatcher.

Handling operations in each of the four busiest plant divisions are under the supervision of an assistant superintendent. It is the duty of each of these zone chiefs—located in the body stamping, final line, trim, and receiving and shipping divisions—to see that handling work proceeds smoothly in their respective areas.

Through telephone contact with the dispatcher, each assistant superintendent can call for additional handling equipment in an emergency, or, conversely, can be called on to rush any available spare equipment to a critical sector where a hot handling problem may exist.

Supplementing this departmentalization, the dispatching office maintains an equipment pool for relief service. Use of this equipment is restricted to answering of special calls or to replace department-assigned trucks in the event of breakdowns. Normally, six drivers work "off-the-desk" handling such assignments.

Because of the dispatcher's strategic location, he is able to dispatch emergency equipment to any plant area with a minimum of travel time. An assignment sheet, a plant-layout wall map with pins to designate location of assigned trucks, and his knowledge of the type and capacity of equipment enable the dispatcher effectively to control handling activities in relation to work to be accomplished.

Auto frames are delivered by fork truck from receiving to storage conveyors adjoining the chassis line. Transfer to assembly line is made by a 1-ton hoist

Periodic Maintenance Enforced

But dispatching is only part of the central-control system. In addition, we have established an elaborate truck-maintenance program which is paying big dividends in keeping equipment in top condition. As the equipment is now relatively new, no appreciable number of equipment failures has been experienced. To insure this record, a periodical check-up and lubrication schedule, which functions without interruption to regular truck operations, is in effect.

Each plant truck is serviced on a regular weekly schedule at a designated hour on a specified day of the week. If the unit is not delivered to the garage at the appointed hour, an immediate telephone check is made to expedite its delivery and maintain the close servicing schedule to which the garage adheres. One driver has the permanent assignment of driving plant trucks to and from the service center.

The maintenance garage allows 30 min. for normal lubrication and checkup work on each vehicle. This preventive maintenance includes complete lubrication and inspection of tire condition, cooling system,

hydraulic mechanism, governor, generator and voltage regulator.

Any worn or defective parts are replaced at this time. Such items as wheel bearings, which are subject to severe wear in plant operation, are overhauled every 3 mo. The garage maintains an inventory of many replacement parts for the 35 different types of vehicular equipment, including highway transportation vehicles, which K-F owns and operates.

A ledger service record, actually a life history of each plant truck, is kept by the garage clerk. This record reveals at a glance what was done on each unit in its previous servicings, what parts were replaced, the name of the mechanic who did the work, when the work was done and the plant department to which the work was charged.

Schedule Scoreboard

In addition to the ledger record, the garage maintains a huge wall "scoreboard" wich has divisions indicating half-hours and days of the workweek. This board shows the jobs scheduled for any given period. Different colored tags hung in each half-hour division indicate the current week's scheduled jobs, work completed and trucks which failed to appear for servicing on schedule.

A weekly summary of the garage's operations, broken down into the various departments to which vehicles are assigned, is prepared and circulated among all departments concerned. This summary shows the number of units assigned to each department, the number serviced on schedule, the number serviced late and the number not serviced.

These figures also appear in percentages so each department head can compare his service record with others. The weekly summary has the effect of impressing on each department the importance of seeing that its equipment is taken care of on the prescribed schedule.

A unique feature of our truck maintenance plan is the "on-the-job exchange" system. Should a truck be in use when it requires lubrication or repair, the maintenance driver delivers a newly serviced truck direct to the job and exchanges it for the unit which requires checking. Thus, no production time is lost.

Train Scheduled from Receiving

Life begins for Kaiser and Frazer automobiles in the two indoor railway and truck receiving rooms. Despite the huge size of the dock area, which totals 70,000 sq. ft., truck operators must work at top speed to unload material and move it to plant storage areas or, in the case of critical parts, direct to assembly lines.

Because of the great variety of materials received, virtually all types of power equipment, pallets and skids are represented at dockside. It is here that hundreds of trailer loads of miscellaneous parts and materials are made up into trains of from 6 to 12 trailers each and dispatched to storage or assembly.

Trailer trains are made up to eliminate one-trip runs and to take full advantage of the payloads of power trucks and trailers. Thus, a 10-unit trailer train might be made up with the first four trailers laden with box skids of small stampings, the next three with palletized cartons of headlamps and the final three with rack loads of over-drives.

On a pre-scheduled route the rear trailer loads are uncoupled and spotted at the appropriate stock locations for subsequent unloading by fork trucks. On its return trip, the tractor picks up the empty trailers and returns them to receiving.

Typical Handling Jobs

Following are some of the typical daily handling tasks which originate at the receiving docks:

Such items as chassis frames arrive vertically in gondolas, are unloaded by 30-ton traveling cranes and are stacked horizontally at dockside. Fork trucks pick up loads of 10 frames each and place them on dead rolls that serve the chassis lines. No pallets or other handling aids are required.

Small parts, such as forgings and stampings which are machined and finished by K-F, arrive in box skids. A caster-trailer train composed of the requisite number of units is readied and a fork truck is assigned to unload the box car. Each skid load, except the last, is placed crosswise on a trailer. The final load is left on the forks of the truck, which then is coupled to the train.

Delivery trips vary from 70 to 300 yards, depending on the parts involved. If mixed loads are trailed, selected trailers are spotted at the appropriate stock location while the train is en route to its terminal destination.

A majority of all finished production parts, such as batteries, starters, axles and springs, arrive strapped or otherwise secured on standard pallets or skids. These are easily unloaded and handled by fork truck and trailer trains. Headlamps, window frames, air cleaners and carburetors, all of which are packed in cartons, are palletized at dockside for quick trailer loading, unloading and storage stacking.

Cooperation with suppliers has made it unnecessary to touch many parts from the time the palletized shipments leave suppliers' plants until they are picked up at K-F assembly lines for installation on bodies and chassis. Parts are delivered to assembly lines from stack storage in the same unit loads in which they leave suppliers' plants.

In addition to wood pallets, hundreds of large steel racks are used for handling and storing stamping assemblies, such as auto doors and deck lids, and 6-cyl. engines. This 4-posted rack equipment is designed especially for storage tiering and rapid handling by fork truck.

The advantage of tiering enables K-F to store 768 rear doors, enough for 384 cars, in a 27 × 27-ft. floor area. Each rack, 39 in. wide and 80 in. long, securely holds 12 rear doors. Thus, double tiering provides storage for 24 doors in an area of only 22 sq. ft. Deck lids and front doors are handled in racks of similar design.

Engines are delivered to Willow Run from the engine division in special steel racks also designed for tiering. Each rack, 90 in. long and 42 in. wide, holds 4 engines. Tiering makes it possible to stock 576 engines in an area only 75 × 25 ft. Other special tiering racks are similarly used in the handling and storing of smaller parts such as over-drives, transmissions and instrument panels.

Trailer Pallets

In addition to pallets and racks, K-F has designed and built a number of special trailer pallets on which odd-shaped body panels can be loaded and hauled in large quantities.

Of special interest are trailer pallets on which large unwieldy hood stampings are transported from the press division to a metal-finishing department 1,300 ft. distant. Handling specialists designed a slotted wood fixture which holds the nose edges of 10 hood panels securely at the front of the trailer with the long cowl portions behind resting one on top of the other.

This pallet is bolted to a 6-ft. caster trailer that has uprights at each corner to support a second pallet of the same design. Thus, each tiered trailer carries a load of 20 hood stampings. From 10 to 12 trailers make up each tractor train, carrying from 200 to 240 stampings per trip.

WE DEPRECIATE AT 10% REINVEST THE SAME YEAR

For eleven years now, Dodge Mfg. Corp. has plowed back annual write-offs on machines and equipment at a rate over the Federal allowance. Result: Production times and direct-labor cost low

BY E. M. CARVER,

First Vice President
DODGE MANUFACTURING CORP.

EVERY dollar that we write off our books for depreciation allowance on machinery and equipment we spend during the next twelve months to buy machinery and equipment. For ten years our company has followed this policy without deviating except by spending more than the reserve in some years; 1947 will be the eleventh fiscal year in which this was true. Actually the policy was established a few years earlier, but until 1937 it was only theoretical; whenever we could, we held back a little cash and thus spoiled our claim to an even longer unbroken succession of 100% replacement outlays.

Why Replace?

Occasionally when we tell a fellow manufacturer of this record, he looks at us with the incredulous glance of a thrifty citizen eyeing a sailor on shore leave and asks; "Why throw your money around that way? You certainly can get a lot of good work out of old machine tools that are completely depreciated. What's the sense in replacing them?"

This question cannot be answered in a single brief sentence. It is not as simple as all that, and has many ramifications. But we are satisfied that we know the answer, that what we are doing is good business, and that our relatively free-spending policy in respect to replacement of machinery and equipment is justified by our production experience.

The effects of a particular policy or move are difficult to isolate from effects arising from other causes. Our policy of reinvesting our entire depreciation annually is no exception. But we always fall back upon two pertinent facts which to us—and to most of the doubters—seem convincing:

1. The time taken in any manufacturing operation in our plant is today no greater than it ever was, despite all of the influences that tug in the opposite direction.

2. Our direct labor cost, in dollars per ton of product, is no greater than in 1941, although wage rates on direct-labor jobs have almost doubled and although the average size and weight of a unit of production made in our plant has decreased considerably.

In fairness we must point out that a business does not operate in a vacuum and that other influences besides our 100% replacement policy may have exerted parallel forces. The most important of these similarly operative factors have been: change in character of product, and increasing total output.

Actually, in most of these ten years we have put into machinery and equipment more dollars than the reserve made up of what we charged off for depreciation. In part this has been necessitated by rapidly shifting production processes. These changes came about because our line of products has changed substantially, continuing a trend that first appeared when individual motor drives began supplanting the line-shafting and related items which once constituted the bulk of our sales. Many of these changes have been toward greater precision, hence have forced us to buy quantities of machine tools that would work to closer limits.

Still another reason why we frequently have had to spend more than our depreciation reserves has been our need for ever-increasing output during the postwar years. We have experienced the brisk demand for product that has characterized many of the durable-goods industries. But observation of some other firms that have the same sort of demand since 1941 keeps us convinced that our replacement policy is basically sound. Many companies which did not reinvest in new machinery but kept their depreciation dollars—and thus their old machinery—have either gone out of business or have lost relative position in their industries to more progressive competitors during these busy years.

Over Federal Rates

We go even further than reinvesting all of the tax-allowed charge-offs in the same fiscal year. We charge off depreciation at a rate beyond what the Federal internal revenue authorities allow in computing tax deductions. The government permits depreciating what it defines as "machinery" over a period of 16 2/3 years or at 6% per annum; the rate for "equipment" is 20 years or 5%. To us these rates seem less than adequate, not only for tax purposes, but also for operating our plant properly. Hence, we set up our own depreciation policies for a composite average of about 10 years or 10%, even though this puts us at current disadvantage tax-wise.

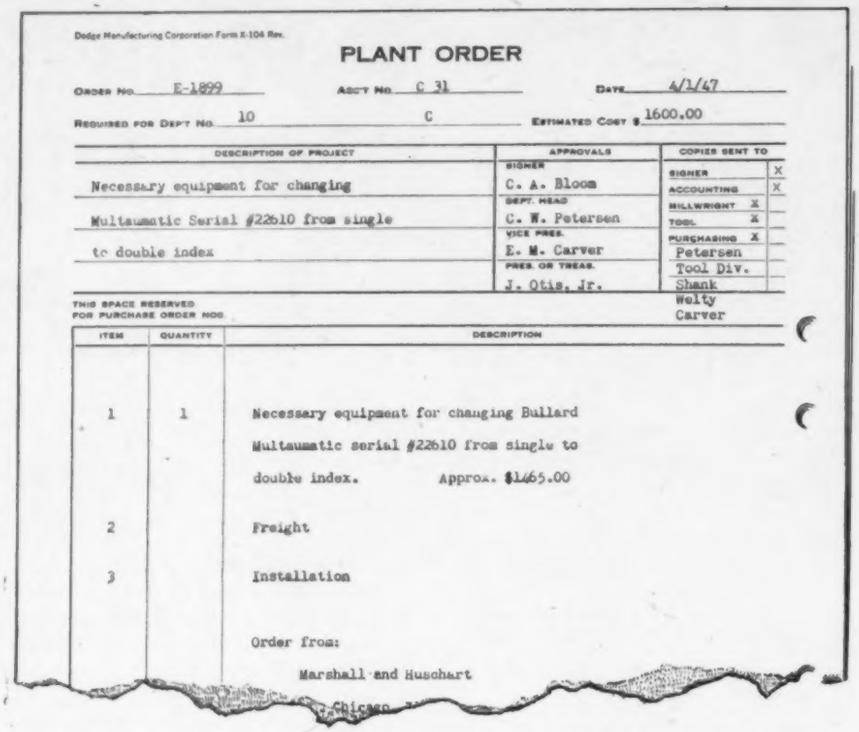
Eventually, if actual experience proves to the tax authorities that our greater rate of depreciation is correct and that we are able to obtain on the average only 10 years of profitable life from our machinery and equipment, presumably they will make an adjustment in our favor. As things are working out, we feel

reasonably sure that over the years the facts will bear out our contention. We are, to all practical purposes, scrapping all prewar machine tools as fast as our budget permits; the used-machinery market yields little better than scrap prices.

In our thinking about machinery and its replacement, we set up a distinction between primary and secondary production tools which might not apply in plants with a different set of manufacturing operations. (We have still another class, the equipment such as materials-handling units which perform functions auxiliary to the actual primary and secondary production.)

The basic function of our particular business is selling holes with something around them. Boring and turning therefore are our major operations. We class as primary those production tools which perform the major operations: turret lathes, grinders, boring mills, multimatics, and the like. Secondary production tools are radial drills, planers, shapers, engine lathes, and so on.

In using our primary production tools, we don't spare the horses. If we can speed a production rate by overcrowding one of these machine tools, we do so without a single regret. We know that to keep up with the competitive parade, obsolescence due to progress in the machine-tool industry will compel us to replace most of our primary production tools in far less than 10 years. Why, then, should we coddle such a machine to prolong its life? It strikes us as far better business to get from it the utmost in production right now, while it is in its prime for producing high-quality, low-cost units. We are entirely willing to wear out a primary production machine in 10 years or less for the sake of getting the maximum current output, rather than nursing it along to outlast its greatest utility as an instrument of top efficiency. This does not, of course, constitute a reason for slighting maintenance or otherwise neglecting the machine tool.



Dodge Manufacturing Corporation Form X-104 Rev.

PLANT ORDER

ORDER No. E-1899 ASCT No. C 31 DATE 4/1/47

REQUIRED FOR DEPT No. 10 C ESTIMATED COST $ 1600.00

DESCRIPTION OF PROJECT	APPROVALS	COPIES SENT TO
Necessary equipment for changing	SIGNER C. A. Bloom	SIGNER X
Multaumatic Serial #22610 from single	DEPT. HEAD C. W. Petersen	ACCOUNTING X
to double index	VICE PRES. E. M. Carver	MILLWRIGHT X
	PRES. OR TREAS. J. Otis, Jr.	TOOL X
		PURCHASING X
		Petersen
		Tool Div.
		Shank
		Welty
		Carver

THIS SPACE RESERVED FOR PURCHASE ORDER NOS.

ITEM	QUANTITY	DESCRIPTION
1	1	Necessary equipment for changing Bullard Multaumatic serial #22610 from single to double index. Approx. $1465.00
2		Freight
3		Installation
		Order from: Marshall and Huschart Chicago

When a purchase of equipment is all set, a formal plant order is issued

Secondary Tools

The problem of obsolescence in our plant is entirely different with secondary production tools, because their contribution to total cost of our product is relatively insignificant. These machines we try to keep within their rated capacities and to treat considerately in all respects. What we could save by crowding them would not be worth the extra wear and tear on the machine. Similarly, what we can save by replacing a secondary machine tool that is still in good working order but absolescent, and substituting one of newer design, is likely to be less important to us than the first cost and the higher carrying charges of the new-type machine.

These differing policies in our use of primary and secondary classes of production tools do not carry through into the actual decision of what we will buy with this year's depreciation money. We re-spend this case for whatever we think will give the best results in the plant, regardless of whether it is a primary production tool, a secondary production tool or auxiliary equipment such as hoists, lift trucks, and foundry equipment. However, it must be clear to any plant man who has read thus far that our thinking and our everyday operating policies usually compel us to spend more heavily on primary production tools than on either of the other classifications.

We make an earnest effort to keep our entire supervisory staff, starting with foremen, abreast of developments in machinery and equipment on the market. For example, as this is written in Mid-August we have invited all of these people to let us know whether they would like to attend the Machine Tool Show in Chicago, and practically every one on the list has signified a desire to go. This is particularly easy for us in 1947 because our plant is less than 100 miles from the Show, and we therefore can split up the eligible list into one- or two-day visits without stripping our plant of supervision. But even when the Show is more distant, we make a strenuous effort to give the opportunity to as many of our people as practicable.

Foremen Advise

Another way in which we rely on the foreman is in making a purchase of any major piece of machinery. He is the man who must use the machine and get out the production. Accordingly, we usually send him out with one of the engineers or production men to have a look before we make the commitment. This proved especially valuable while we were picking up occasional War Assets Corporation machine tools; the foremen found a good many flaws which had not occurred to the minds of folks higher up the organization chart, and thus prevented our making some costly mistakes.

Another rule that has saved us from mistakes is that, barring extremely unusual circumstances, we buy only machinery made by standard manufacturers who are widely recognized as leaders in their special fields. We base this policy on the general assumption that these

leaders will average out to give sound value and progressive design. From time to time we have missed a good new product by holding to this rule, but it has saved us even more frequently from buying lemons. Six months or thereabouts before the end of the fiscal year, we normally set about making a list of what we should like to buy for the plant. If the boys in the production and manufacturing departments ever should come up at this stage of the proceeding with requests aggregating less than five times as much as we could conceivably afford to budget for the purpose, we would feel that they had lost a desirable part of their enthusiasm. The assistant superintendents ordinarily whittle this dream world down to half the original total. In the course of being worked over again and again in other informal talks with the folks who originated the items, the list shrinks to perhaps double the figure that will eventually appear on the budget.

Now It Is Written

At this point it is reduced to writing and forwarded to top management, who approve the most promising projects and throw out the rest. If the final figure exceeds the depreciation, the budget is submitted to the board of directors for approval. We make it a rule never to approve in the original appropriation a dollar value equal to the budget. If we have $400,000 budgeted, the manufacturing department can expect authorizations totaling $300,000 to $325,000 worth of purchases with the status of "must." The other $75,000-$100,000 we hold back to cover oversights in planning, unforeseen emergencies and developments which experience demonstrates will bob up during the fiscal year looking so important that they simply cannot be put off. As it is, before the fiscal year closes we usually have to boost the authorizations beyond our original intentions.

An inevitable result of buying modern machine tools is that total capacity increases. The new unit almost always turns out more pieces, at a lower cost. This incubates such requirements as a length of gravity-feed conveyor to bring blanks to the operator, and an electric lift truck to supplant the hand lift truck which was adequate to carry finished parts from the old machine. With the added productivity of the new machine tool, it becomes desirable to buy a new core oven for the foundry so that it can maintain an ample supply of castings for machining. The extra money that we put in the kitty as a precaution when we authorize major purchases is intended to pay for as many of these extras as we can stretch it across. The newer machine tools that are coming out are amazingly productive, and they force a plant management to install the auxiliary equipment so the manufacturing department can take advantage of their boost in output.

Forced Increases

A great deal of our increase in plant capacity has come about in this manner, almost beyond our control once we have bought better machine tools. Another sizable increase has come through re-engineering a production method. Our pet example of this is the department that makes dual-duty V-belt sheaves. This product went into the plant about 15 years ago. We have meanwhile made five complete shifts of manufacturing method, each process being more productive and more economical than its predecessor. Most of this has occurred through the replacement policy we are describing, using funds provided by depreciation write-offs. We have also increased capacity in this and other departments by the conventional route: using capital funds to buy new machinery and equipment, thus adding to invested capital. But even if we had not been compelled during recent years to keep increasing output and shifting our production processes, this policy of spending our entire year's depreciation charge-off or more would have proved itself profitable.

The method by which we originate and control purchases of machinery and equipment from the original request to the time of installation and payment is rather simpler than that employed in some organizations. It probably would be too informal for a really large corporation, but it works out admirably for us.

As has been described earlier, the items which will eventually be formally authorized for purchase by the top management and the board of directors do not start out in written form. They remain mere conversation until they have been informally sifted by talks between the men who had the original ideas, and their immediate superiors.

When the obvious improbabilities have been eliminated by this process, the surviving projects go into a list which gets a more formal going-over by the manufacturing department. What emerges from this ordeal consists of items which may be expected to be purchased if affairs take their normal course.

Only at the point where the project is all set to go does it assume the formal shape of a plant order. We find that a plant order is a better way of handling the job at the outset than a written requisition. The plant order shows exactly who originated and approved the project at each step all the way up, according to its size.

Another advantage is that copies of the order are forwarded as a matter of routine to each individual in the organization who will be affected in any way. This occurs immediately after the order has been okayed. It is duplicated on a Ditto machine, and copies are distributed as specified by the signer, the man who originated it.

He always gets a copy. Another goes to the accounting department. If a purchase is involved, a copy goes to the purchasing department. (Some major projects merely require operations to be performed inside our own organizations, hence purchasing would not be involved.)

If the machine will have to be set or moved, a copy goes to the millwright. If any tool changes will result, the tool division gets a copy. If a new machine foundation will be needed, the construction department learns of it in this way. Thus the originator of the project has the responsibility for making sure that everyone is informed in advance, and everyone affected automatically starts to work on his part of the job in time to meet the schedule.

TIPS for Top Shop Men

205 Take time, as you can, to note vital dimensions, layouts, connections, materials. Then, in case of a breakdown, you don't lose time on preliminaries. One foreman did it with a "log" record, including prints and photos.

206 Give men a break in learning to operate other machines than their own, in trying other jobs than their own—but also insist that they leave other's jobs and machines alone day by day. You can thus provide variety, stimulate interest, discover hidden talents—yet avoid smashups and arguments.

NEAT APPEARANCE of the mobile surface-finish analyzer creates respect for quality control. It is made up of 1/16-in. steel sheet on a 1-in. channel frame

COMPARTMENTS for all needed instruments and accessories avoids trips for forgotten items and speeds actual shop measurements of surface finish

Mobile Laboratory Measures Surface Finish in the Shop

BY A. A. GOODMAN, SUPERVISOR, GAGE LABORATORY, STEAM DIVISION WESTINGHOUSE ELECTRIC CORPORATION

Where big equipment is built, it is more convenient to take the surface-finish and flatness measuring devices to the job

MODERN EQUIPMENT is designed for ultimate efficiency plus long life, but these considerations tend to put greater stresses on all the component parts. More attention is therefore given to surface finish of journals, seals, all radii (especially where one highly stressed section blends into another one), bored turbine disks, turbine spindles, gear blanks that are shrunk on shafts, turbine extraction port rings, turbine bladings, thrust collars and other kindred machined parts.

To control quality, there must first be means to evaluate it in specific and repeatable increments of measurement. Surface finish or roughness is no exception. To control the desired quality level of finishes, our Gage Laboratory has Profilometers, Faxfilm apparatus, optical flats, monochromatic lights, microscopes.

But much of the apparatus built at the Steam Division is of large size. Soon we found that we had to bring the various measuring equipment to the job rather than the job to the equipment. Furthermore, on taking a time study of an operation, or during the development of an operation, it is advantageous to have the measuring equipment at the immediate command of the interested personnel. So, we recently designed and installed a mobile surface-finish analyzer.

Two purposes were thereby served; first, the mobile laboratory brought

all needed and portable equipment from the Gage Laboratory to the job rapidly and conveniently; second, as one of the functions of a Quality Control Department is to stress "good housekeeping" and neatness, the equipment is an effective example of what may be accomplished.

The mobile unit itself was constructed of 1/16-in. sheet steel welded to a 1-in. steel channel frame. Three chromium-plated hinges support the door, which is suitably framed with stainless steel strip; a chromium-plated latch completes the door details. Two 10 x 4 four-ply pneumatic tires on ball-bearing wheels support the unit and serve as automatic shock absorbers for the transported equipment. Two 1½ x 1½-in. hollow legs, furnished with rubber pads as "anti-skids," are the front supports. Rubber bicycle handle bar grips finish off the handles on the back. A 100-ft. rubber extension cord on a reel that ends in a four-outlet electrical box is a permanent installation.

The unit is finished in gray crinkle enamel and stainless steel.

Standard complement carried in the mobile unit consists of:

Type "Q" Profilometer, complete with an "MA" tracer for hand operation on external surfaces, a "J" tracer for hand or Mototrace use on flat surfaces, large bores and gear teeth and an "AW" tracer for Mototrace use on small bores and reamed holes. Two 10-ft. extension cords give the unit a maximum range of 27 ft., tracer to Profilometer.

Type "V" Mototrace for machine-controlled operation of the various Profilometer tracing heads.

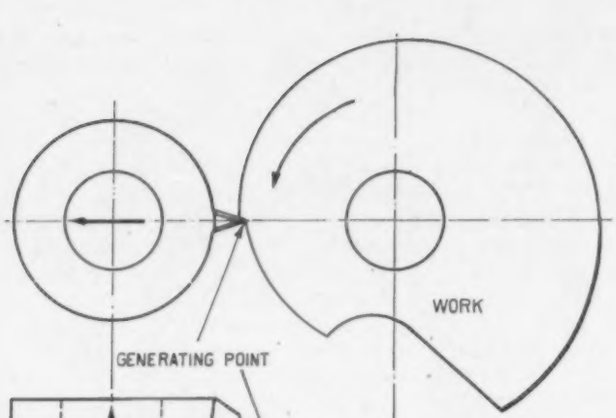
A Profilometer reading recorder for issuing a recorded tape for permanent record. Such recorded surface-finish measurements may be attached to time studies, communications with suppliers or customers, and serve as a graphic illustration of how well the actual finish measures up to the desired or specified finish.

Optical-flat inspection apparatus is included. This equipment is used when it is desirable to determine the actual error in flatness of apparatus, particularly where the need for a critically accurate surface is indicated, such as thrust collars, sealing rings and allied apparatus. Equipment furnished consists of a 3-in. optical flat accurate to 0.000002 in. flatness and a helium monochromatic light source. Surfaces that are not absolutely flat are easily detected; the height or depth of ridges, valleys or chamfered edges are quickly measured.

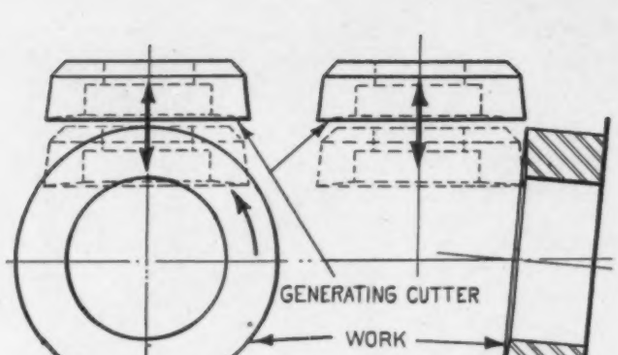
A 40-power shop microscope with self-contained light source and a 0.10-in. etched scale graduated into thousands is found useful when examining the working edges of tools as well as ground or tooled surface finishes.

A small 3X hand viewer is used to examine microscopically the impression for rapid on-the-spot analysis. Should a larger amplification be found advisable, a 100-watt projector equipped with an f2.4 lens projects brilliant enlargements up to 100X.

Equipment adequate to quality control of turbine-part finishes consists of a Profilometer with several tracing heads, a tape recorder, optical-flat equipment, Faxfilm materials for taking impressions of surfaces, microscopes and scales



Cam Generation—By reciprocating a single-point tool and feeding it toward or away from the work, a cam shape may be generated. Obviously, combinations of rotation and radial feed will also produce cylinders, elliptical or irregular sections, including lobed cams



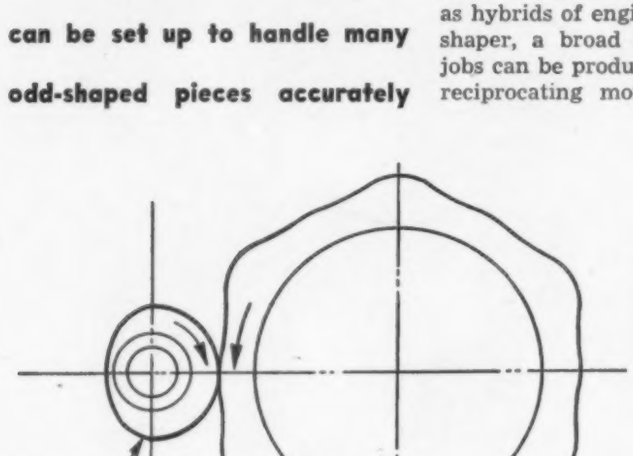
Cone-shaped End—By setting the cutter spindle at the desired angle to the work axis, external or internal cones may be generated on the work. Feeding, or synchronizing a "conjugate" cutter, will produce irregular conical surfaces on center or off center—or with a series of offset centers

Illustrations courtesy The Fellows Gear Shaper Company

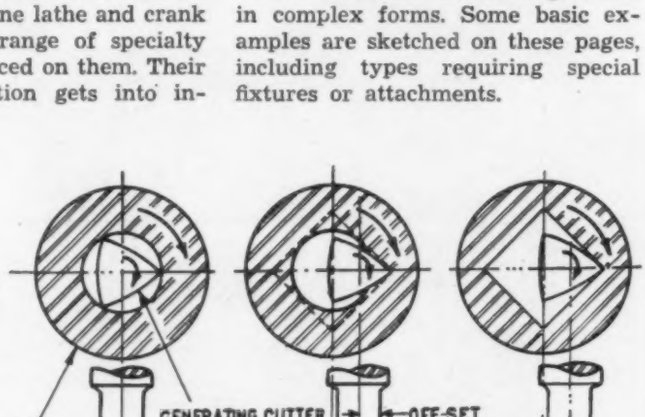
CRANKY SHAPES YIELD

Gear shapers, hybrids "between" engine lathe and crank shaper, can be set up to handle many odd-shaped pieces accurately

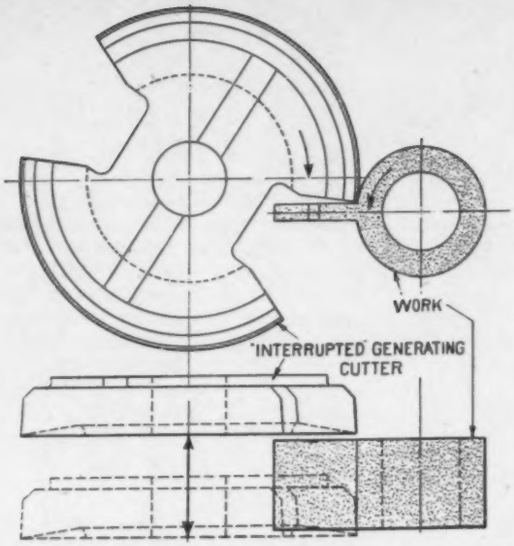
GEAR SHAPERS are familiar to most men in Metalworking for their primary purpose—generating gears. But if these machines are considered as hybrids of engine lathe and crank shaper, a broad range of specialty jobs can be produced on them. Their reciprocating motion gets into internal surfaces and narrow recesses. With the rotary motion, either of work or tool, or of both, surfaces can be machined at odd angles and in complex forms. Some basic examples are sketched on these pages, including types requiring special fixtures or attachments.



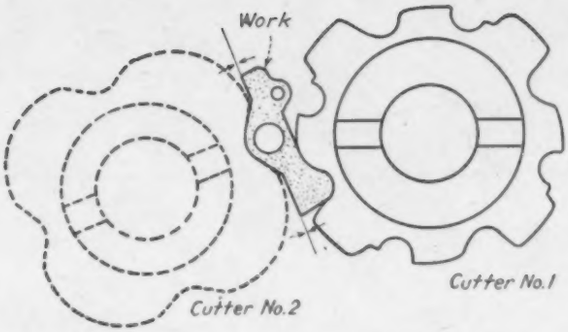
Irregular Cam—Feeding a reciprocating disk cutter laterally as the work rotates (or vice versa) will generate a simple irregular cam. A "conjugate" cutter, however, can handle more complex shapes, rotary feed alone being involved. Cutter and work rotary feeds must be synchronized, however. In the example sketched, the cutter is rotated six revolutions per work revolution, by setting change gears as in gear-cutting



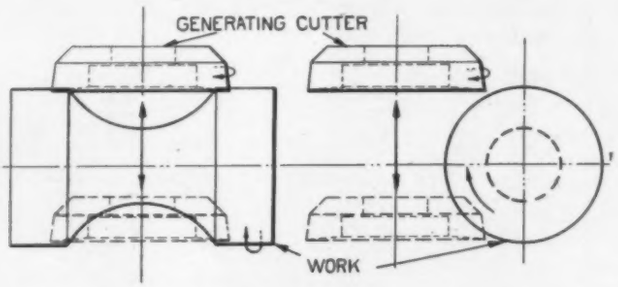
Square Hole—Such a hole can be generated by a single-point, square or 3-cornered cutter. To get sharpest possible corners with minimum complication in feed, the latter method is used, the "rolling" circle used in generating passing through the sharp corner on work and cutter. Thus the cutter "rolls" on its sharp point as it passes the corner, elsewhere generates a flat surface with its rounded side. All sorts of polygons and irregular holes can be generated similarly



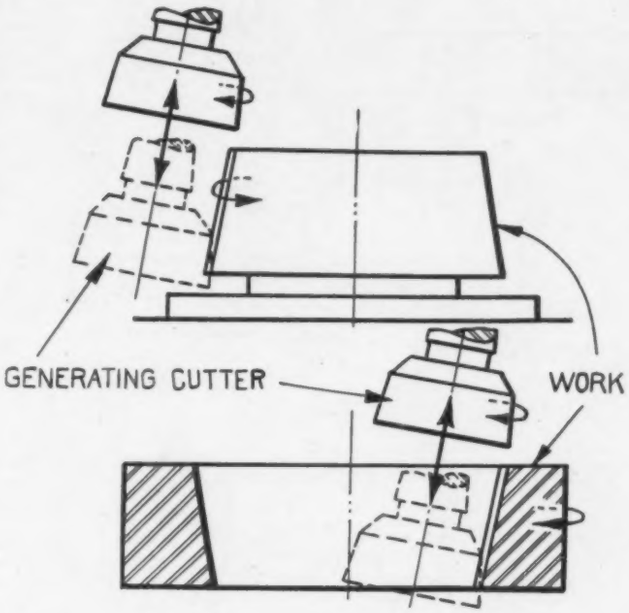
Interrupted Surface—Here a vaned-rotor for a refrigerator pump is cut with an "interrupted" cutter, used when a projection, change of shape or other irregularity requires. The machine requires a limit switch and a reversing-type geared motor, the switch to stop the machine when the cutter reaches the projection; the motor reverses direction of work and cutter for finishing. A special feed cam advances the cutter between cuts. Finish is very smooth and to close limits. The cutter could be made so its second lobe would do finishing



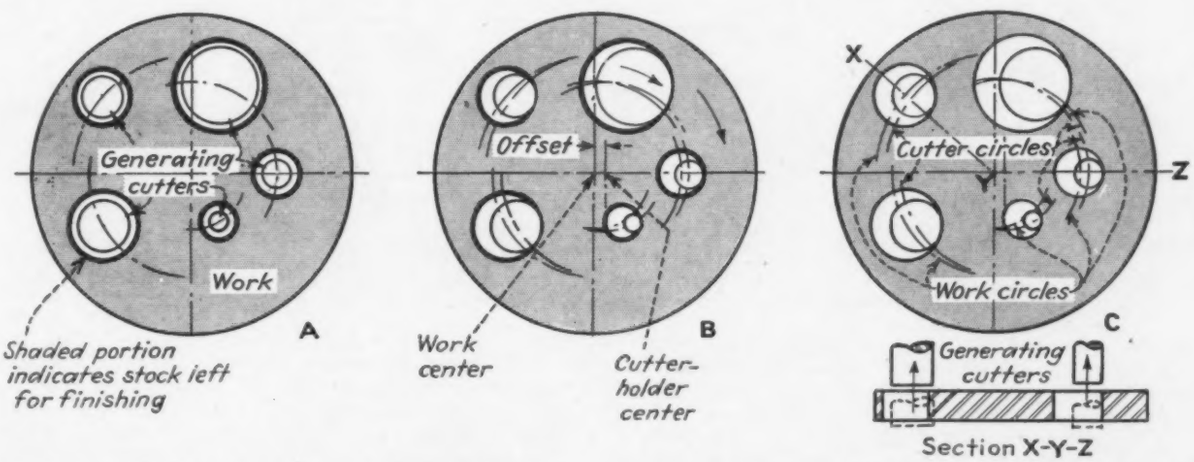
Irregular-shaped Pawls—With a magazine or dial fixture which permits continuous loading, parts such as these cams can be machined on a gear shaper. Two conjugate cutters are used in turn, producing extremely accurate profiles which can be finished by buffing alone



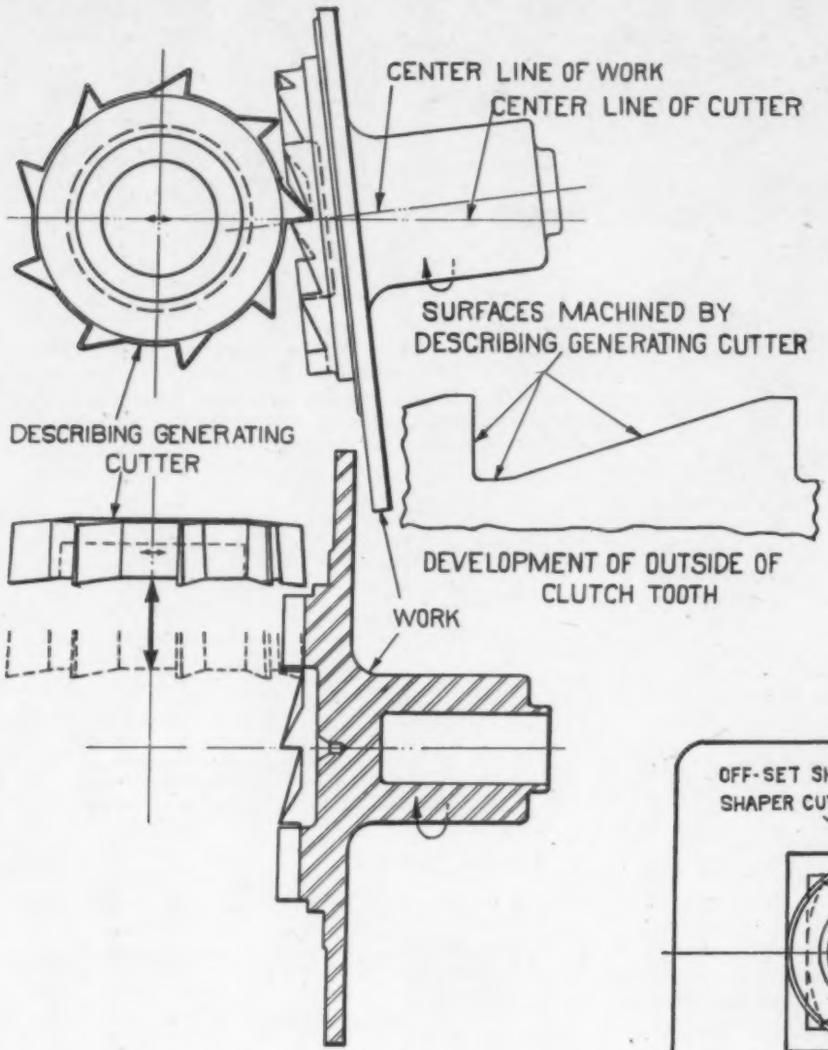
Hourglass Shape—A throated or hourglass shape of circular cross-section can be generated by setting cutter and work spindles at right angles and rotating both. If no endwise motion occurs, throat shape will be that of the cutter; if the work is moved axially, a flat can be produced at the base of the throat



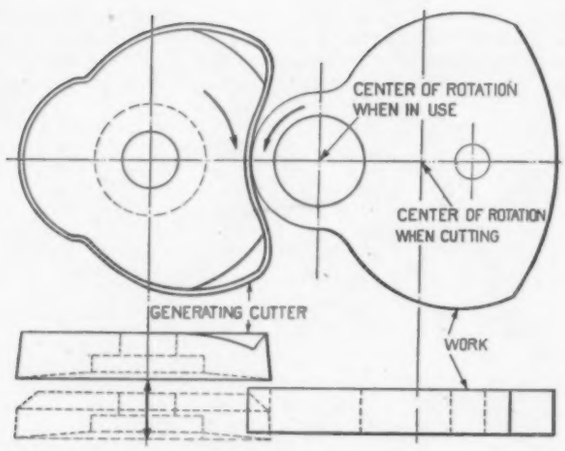
Taper Surfaces—If a circular cutter is reciprocated at an angle to the work axis, a conical surface is generated. Inside or outside surfaces can be cut—or the two made parallel. Taper-blocking between base and bed does the job



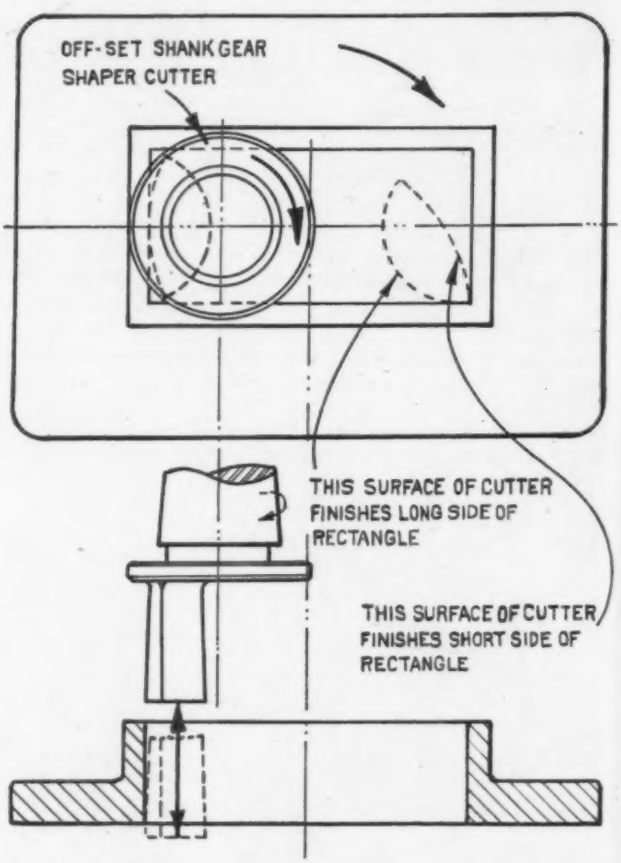
Multiple Holes—Holes of the same or different diameters, center radii and angular spacing. Here five cutters (like round punches) are held in a holder at correct angular spacing and radius. Work is held in a fixture. Tools are of diameters relative to hole diameters. Tools are centered in drilled holes (A), the saddle advanced to give desired "offset" (B), and both spindles make one revolution. Holes may just as readily be of irregular shape


CENTER LINE OF WORK
CENTER LINE OF CUTTER
SURFACES MACHINED BY DESCRIBING GENERATING CUTTER
DESCRIBING GENERATING CUTTER
DEVELOPMENT OF OUTSIDE OF CLUTCH TOOTH
WORK

Jaw-Tooth Clutch—Here a single point cuts an engine part held in a fixture at an angle, so the cutter will not scratch tooth faces. Only a single cutter tooth is used at a time. A special feed cam and an electrical unit for intermittently rotating the depth-feed camshaft are required. The cutter actually cuts down the "slope" of the tooth until it reaches full depth, then finishes the face and is withdrawn to start the next tooth



Brake Cam—In producing irregular shapes, it may be advisable to locate work off-center in the fixture to simplify cutter design, equalize stock removal, machine surfaces of different lengths or shapes, or combine shapes on a part. In this case cutter design is simplified and undesirable cutter undercut avoided. The rough-milled part is held on a work-locating stud in the fixture, off-center an amount equal to distance between centers of large hole and of rotation. Center-distance relationship can be changed while cutting if desired


OFF-SET SHANK GEAR SHAPER CUTTER
THIS SURFACE OF CUTTER FINISHES LONG SIDE OF RECTANGLE
THIS SURFACE OF CUTTER FINISHES SHORT SIDE OF RECTANGLE

Rectangular Hole—An unusual job, in which the cutting portion of the generating cutter is eccentric to center of rotation of its spindle. Two sides of the hole are about twice as long as the other two and sharp corners are required so the "long" cutter side has a shorter radius but longer surface. It "skids" to compensate for difference between its length and that of the side produced. The flatter side is equal to the short side of the rectangle. Cutter makes two rotations per work rotation

TALKING SHOP

Feathered Fabricators

BIRDS have been quick to seize upon the advantages of modern materials. Games Slayter, v.p. in charge of research for Owens-Corning Fiberglas Corp., reports that all nests in the vicinity of the company's Newark, Ohio, plant are now fabricated of Fiberglas.

Maintenance Plan

LACK of an international standard thread has caused one American manufacturer to produce for the export market a tractor in which there are no tapped holes. Bolts and nuts are used everywhere. If a replacement becomes necessary and the proper bolt cannot be obtained, any foreign bolt of approximately the same diameter will serve.

Two-Timer

STRANGEST industrial yarn of the year, according to Tony Weitzel's column in the *Detroit News*, is this: The night foundry superintendent at Ford and the day super were talking together when a worker strolled by. The night super called, "Hey Jones!" The day super snapped: "That isn't Jones . . . that's Joe Smith!" They checked, discovered the man has worked two shifts daily for months, using different names and having different social security numbers.

Carbides Coming

CARBIDES were everywhere in evidence at the Show—from conventional tools to the new ones with carbide rounds, squares and triangles cutting on the end. Still newer is the idea of a toolholder with disposable carbide cutting edge—five edges forming a carbide pentagon spaced around a center tit which locks into the toolholder end.

Double Header

C. E. WILSON brought back from Texas the story of the lady on a transcontinental train crossing the Panhandle. She saw two hogs in line along the right of way, asked the brakeman what they were doing. "Rooting, lady," said the Texan, "Out here the ground is so hard they need double-headers!"

Reminds us of the time the Dallas native asked us if we'd noticed the neon-outlined "flying red horse" atop the Magnolia Petroleum Bldg. As it's visible day or night for 30 miles or more in any direction, we nodded agreement. "That's not the one horse they started to put up there—that's TWO horses side by side," he pointed out. "We insisted on it—nobody's gonna call Dallas a one-horse town!"

Aluminum or Steel?

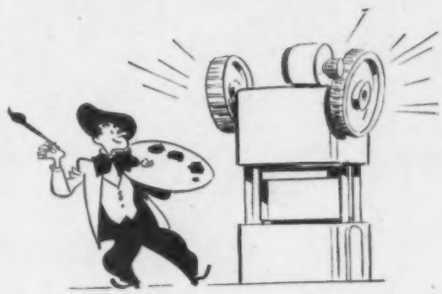
TWO MAJOR AUTO manufacturers have been experimenting with aluminum instead of hard-to-get steel for hood tops. Big sheets and tonnage are involved, but fabrication of aluminum—particularly welding—presents real problems on this job.

Eye Eeee

OUR FAVORITE name tag from the Machine Tool Show was one which identified its wearer as a "consulting and insulting engineer." Apparently the typist had dealt with his type before; saw nothing out of order.

Trucking

WHEN two or more humans assemble, one must apparently show off. One visitor at the Machine Tool Show, showing off his knowledge of lift trucks, pressed a switch. The truck came at him, and for the moment there was some question about who'd win. Other visitors also showed the penchant for dangerous experiments, pointing with canes, folders or other souvenirs at high-speed cutters or gear trains. Some acted as if they'd never seen a shop.



Pretty Presses

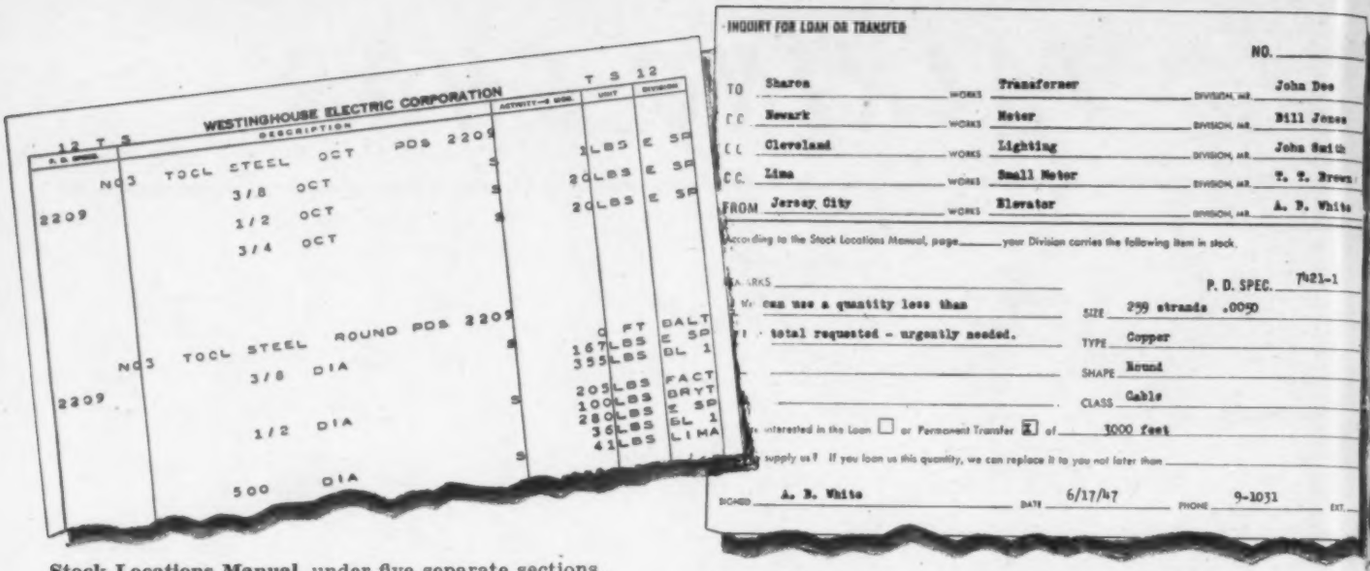
PRESSES at Willys-Overland, Toledo, are painted in color to improve appearance, seeing and safety. Base color is a creamy light green, with working parts orange, die edges red.

Torch Eases Draw

POOR DRAWING-QUALITY SHEET, all that was available, tore in the flange when bent to form a small auto part. It was necessary to station an extra operator at the press, to heat with an acetylene torch the area of maximum draw on each blank. Not an economical production method, but a solution of a temporary problem.

Slipstick Story

J. T. CONDER, commercial director of American Electric Fusion Co., Chicago, is a Purdue graduate, so goes slide-ruling every so often. His latest statistic harks back to the cast-iron days when metal products were sold by the pound. From the bills of lading, he took the weights of a new Warner & Swasey 3A turret lathe, a Cincinnati Filmatic grinder, and an A.E.F. tube mill—three machines about as different as they come. Yet cost variation was less than 4 cents a pound—around $1.50. May be coincidence; try it for your products on your Keuffel & Esser.


WESTINGHOUSE ELECTRIC CORPORATION

A.S. WORK	DESCRIPTION	ACTIVITY—4 MOS.	UNIT	DIVISION
2209	NO3 TOOL STEEL OCT PDS 2209	5	1 LBS	E SP
	3/8 OCT	5	20 LBS	E SP
	1/2 OCT	5	20 LBS	E SP
	3/4 OCT			
2209	NO3 TOOL STEEL ROUND PDS 2209	5	0 FT	DALT
	3/8 DIA		167 LBS	E SP
			355 LBS	BL 1
			205 LBS	FACT
	1/2 DIA	5	100 LBS	BRYT
			280 LBS	E SP
			36 LBS	BL 1
			41 LBS	LIMA
	500 DIA	5		

Stock Locations Manual, under five separate sections, lists all raw material and standard hardware stocked in each division. Any company with decentralized plants should find such a manual valuable in purchasing materials and balancing inventories

INQUIRY FOR LOAN OR TRANSFER NO.

TO	Sharon	Transformer		John Doe
CC	Newark	Meter		Bill Jones
CC	Cleveland	Lighting		John Smith
CC	Lima	Small Motor		T. T. Brown
FROM	Jersey City	Elevator		A. B. White

According to the Stock Locations Manual, page ____ your Division carries the following item in stock.

REMARKS ____ P. D. SPEC. 7421-1

We can use a quantity less than ____ SIZE 259 strands .0050

Total requested - urgently needed. TYPE Copper

SHAPE Round

CLASS Cable

Interested in the Loan ☐ or Permanent Transfer ☒ of 3000 feet

supply us? If you loan us this quantity, we can replace it to you not later than ____

SIGNED A. B. White DATE 6/17/47 PHONE 9-1031 EXT.

Inquiry for Loan or Transfer form presents information on availability of materials in other divisions that have an activity in the same materials. This form is for emergency use only when a shortage would mean a production delay and probable loss

Manual Coordinates Decentralized Stocks

BY G. R. KEPNER, DIRECTOR, HEADQUARTERS PRODUCTION, WESTINGHOUSE ELECTRIC CORPORATION

Material shortages, inactive stocks, excess inventories, too many new orders can be avoided by a Stock Locations Manual that shows what and how much of any material each plant uses

TO overcome difficulties involved in locating and procuring adequate materials, Westinghouse has developed a "Stock Locations Manual" to be used, by local divisions, as a means of helping each other. It is extremely valuable among our 30-odd divisions, and we feel that it can be of equal value in small companies having two or three decentralized plants.

Listed in the manual are all raw material and standard hardware stocked in each division. By reference to its contents, any division desiring to purchase materials can determine whether an order should be placed with an outside supplier or procured from another division carrying adequate or excessive stocks.

Objectives of the manual are:

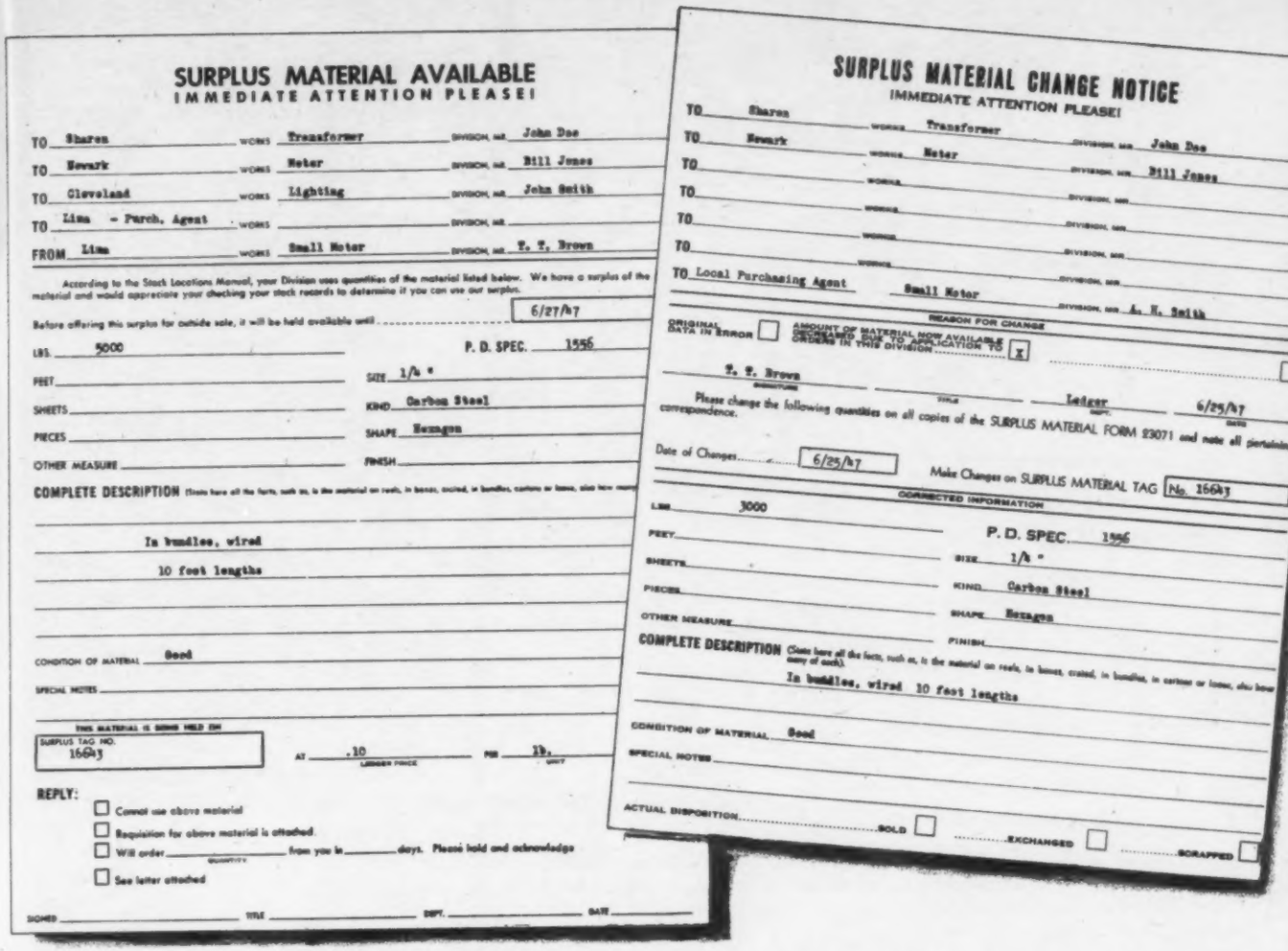
1. To facilitate transfer of materials between divisions. Those needing a particular kind of material, not currently available in their own storeroom, can immediately refer to the manual, locate other divisions carrying the needed material, contact these sources and request the loan or permanent transfer of a sufficient quantity to fill requirements.

2. To utilize excessive and inactive stocks. Materials used infrequently or only in small quantities can be transferred to a large user and secured as needed.

3. To reduce orders placed for special non-stock materials. Reference to the manual will enable a division to obtain many materials not stocked by themselves but carried as standard in other divisions.

4. To serve as a basis for establishing central material locations. With proper arrangements a larger user can order a quantity of material sufficient to meet its own requirements and also carry enough to supply small users as needed. This will reduce the number of purchase orders for identical material. It likewise will reduce the size of duplicate inventories, as all such material will be carried in one division or a central materials location, with only operating inventories being maintained in the "small-use" divisions.

5. To serve as a basis for consolidating buying negotiations. Through development of data in this manual, buying negotiations can be made on the basis of full corporation usage, thus affecting price savings as well as efficiencies in general purchasing and clerical work.



SURPLUS MATERIAL AVAILABLE
IMMEDIATE ATTENTION PLEASE!

TO Sharon WORK Transformer DIVISION, NO. John Doe
TO Newark WORK Motor DIVISION, NO. Bill Jones
TO Cleveland WORK Lighting DIVISION, NO. John Smith
TO Lima - Purch. Agent WORK DIVISION, NO.
FROM Lima WORK Small Motor DIVISION, NO. T. T. Brown

According to the Stock Locations Manual, your Division uses quantities of the material listed below. We have a surplus of the material and would appreciate your checking your stock records to determine if you can use our surplus.

Before offering this surplus for outside sale, it will be held available until 6/27/47

LBS. 5000 P. D. SPEC. 1556
FEET SIZE 1/4 "
SHEETS KIND Carbon Steel
PIECES SHAPE Hexagon
OTHER MEASURE FINISH

COMPLETE DESCRIPTION (State here all the facts, such as, is the material on reels, in boxes, crated, in bundles, cartons or loose, also how many of each).

In bundles, wired
10 foot lengths

CONDITION OF MATERIAL Good
SPECIAL NOTES

THIS MATERIAL IS BEING HELD ON
SURPLUS TAG NO. 16643
AT .10 LARGER PIECE PER lb. UNIT

REPLY:
☐ Cannot use above material
☐ Requisition for above material is attached.
☐ Will order _____ QUANTITY from you in _____ days. Please hold and acknowledge
☐ See letter attached

SIGNED _____ TITLE _____ DEPT. _____ DATE _____

SURPLUS MATERIAL CHANGE NOTICE
IMMEDIATE ATTENTION PLEASE!

TO Sharon WORK Transformer DIVISION, NO. John Doe
TO Newark WORK Motor DIVISION, NO. Bill Jones
TO WORK DIVISION, NO.
TO WORK DIVISION, NO.
TO WORK DIVISION, NO.
TO WORK DIVISION, NO.
TO Local Purchasing Agent Small Motor DIVISION, NO. A. N. Smith

REASON FOR CHANGE
ORIGINAL DATA IN ERROR ☐ AMOUNT OF MATERIAL NOW AVAILABLE INCREASED DUE TO APPLICATION TO ORDERS IN THIS DIVISION ☒

T. T. Brown SIGNATURE Ledger TITLE DEPT. 6/25/47 DATE

Please change the following quantities on all copies of the SURPLUS MATERIAL FORM 23071 and note all pertaining correspondence.

Date of Changes 6/25/47 Make Changes on SURPLUS MATERIAL TAG No. 16643

CORRECTED INFORMATION
LBS. 3000 P. D. SPEC. 1556
FEET SIZE 1/4 "
SHEETS KIND Carbon Steel
PIECES SHAPE Hexagon
OTHER MEASURE FINISH

COMPLETE DESCRIPTION (State here all the facts, such as, is the material on reels, in boxes, crated, in bundles, in cartons or loose, also how many of each).

In bundles, wired 10 foot lengths

CONDITION OF MATERIAL Good
SPECIAL NOTES

ACTUAL DISPOSITION SOLD ☐ EXCHANGED ☐ SCRAPPED ☐

Surplus Material Available form notifies other divisions when materials are to be declared surplus and gives them the chance to obtain them before they are made available for sale outside. Such notices are sent to all divisions listed as users in the manual

Surplus Material Change Notice form shows any change in availability of surplus material previously reported to other divisions. This procedure keeps current all data expressed on the surplus tag. Change date and surplus tag number must be entered in proper boxes

The manual, reviewed once each year to keep it constantly up-to-date, is divided into five sections: Metals, Tool Steels, Wire and Cable, Hardware and Miscellaneous, with each section segregated according to class, type, shape, specification and size. Indicated in each section is an approximate 6-mo. material usage in each division, as well as possible substitute specifications.

The manual embodies many necessary features to facilitate procedure and easy reference. For example, it lists only those divisions which stock a particular item to eliminate checking of all divisions for the item. Also, classification of types in the metals section is made up to combine strip, sheet, plate and rectangular bar stock, under the single heading of "flat."

The method of compiling data on manual sheets is outlined here briefly:

Assembling Data: Each participating division of the company provided data, concerning their stocks, for the printing. The form used for this purpose was so designed that information could easily be transcribed to tabulating cards.

Page Setup: Company divisions were tabulation-printed in the extreme right-hand column of the new page, on the same line with the other information pertaining to the material. In instances where more than one division carried the same type and size stock, a line was devoted to each division.

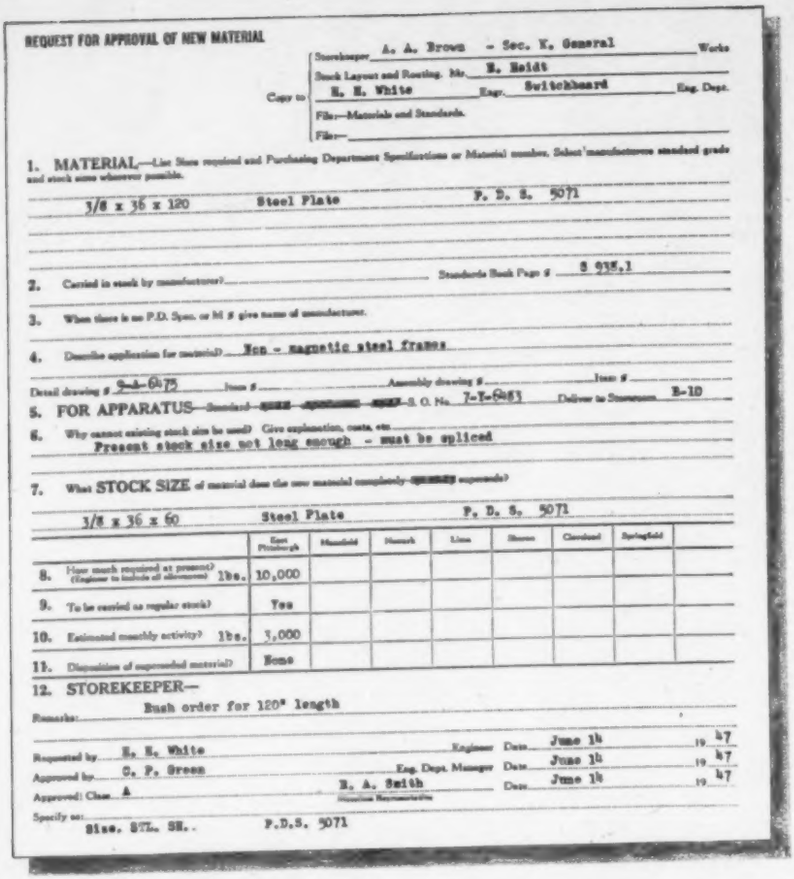
Line Length: The page arrangement was limited by the scope of equipment used. The maximum line length available was 8 in. (51 characters spaced at 5/32 in.). This made it possible for the sheet to be printed with the 11-in. dimension vertical, providing greater depth of page.

Printing: The 50,000-odd cards were sorted to the desired stock sequence and tabulated on continuous duplicating masters which were run off on a Multilith Duplicator. This master, the Systemat, is made of heavy paper-like composition and is good for 1,000 copies. Cost: Slightly over 13 cents each, including preprinting of page form on mat.

Several other forms are needed in executing the various functions of the manual. These forms are listed below:

1. Inquiry for Loan or Transfer.
2. Surplus Material Available.
3. Surplus Material Change Notice.
4. Request for Approval of New Material.

Value of the manual was demonstrated in its first application in the disposal of materials in one of our "war-terminated" divisions. In this particular liquidation many thousands of dollars worth of raw materials and standard hardware were diverted to eight different divisions. All this material, consisting of 625 separate items, had previously been



REQUEST FOR APPROVAL OF NEW MATERIAL

Storekeeper A. A. Brown - Sec. K. General Works
Stock Layout and Routing. Mr. E. Reidt
Copy to E. E. White Engr. Switchboard Eng. Dept.
File—Materials and Standards.
File—

1. MATERIAL—List Sizes required and Purchasing Department Specifications or Material number. Select manufacturers standard grade and stock sizes wherever possible.

3/8 x 36 x 120 Steel Plate P. D. S. 5071

2. Carried in stock by manufacturer? Standards Book Page # S 935.1
3. When there is no P.D. Spec. or M # give name of manufacturer.
4. Describe application for material? Iron - magnetic steel frames
Detail drawing # 9-A-6475 Item # Assembly drawing # Item #
5. FOR APPARATUS—Standard S. O. No. 7-Y-6483 Deliver to Storeroom B-10
6. Why cannot existing stock size be used? Give explanation, costs, etc.
Present stock size not long enough - must be spliced
7. What STOCK SIZE of material does the new material completely supersede?
3/8 x 36 x 60 Steel Plate P. D. S. 5071

		East Pittsburgh	Mansfield	Newark	Lima	Akron	Cleveland	Springfield	
8.	How much required at present? (Engineer to include all allowances)	lbs. 10,000							
9.	To be carried as regular stock?	Yes							
10.	Estimated monthly activity?	lbs. 3,000							
11.	Disposition of superseded material?	None							

12. STOREKEEPER—
Remarks: Rush order for 120" length

Requested by E. E. White Engineer Date June 14 19 47
Approved by C. P. Green Eng. Dept. Manager Date June 14 19 47
Approved: Class A H. A. Smith Inspection Representative Date June 14 19 47
Specify as: Size. STa. SR. P.D.S. 5071

Request for Approval of New Material form aids in simplifying and standardizing the addition of any new stock item. It not only specifies what is needed but also why the new item is to be stocked

listed as scrap. Through the use of the manual, 88% of the items were found to have identical listings in other divisions. This made stock liquidation relatively simple.

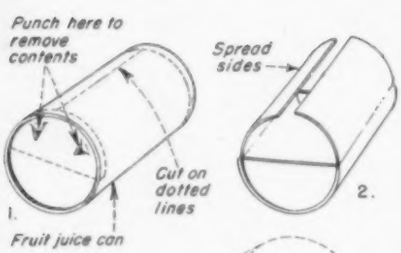
When shortages of critical materials arise, a special monthly supplement to the current "year" manual may be issued to cover the portion affected. This will give a current picture of company-wide material usage and requirements.

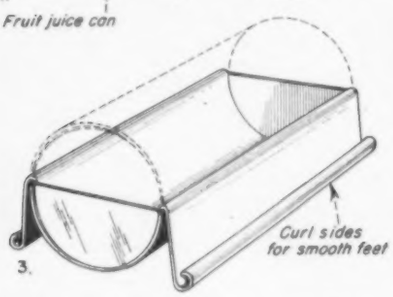
We presently are compiling a monthly listing of copper stocks to alleviate the procurement problems encountered during these critical times. This monthly supplement is of a temporary nature and will be discontinued as soon as materials again become available.

To have this monthly company-wide picture of copper stocks and requirements, each divisions forwards information concerning their stocks to the headquarters production department no later than the second working day of each month. There it is compiled into booklet form and distributed to all divisions during the first week of each month. This current information enables divisions, in dire need of materials, to borrow from those divisions that have large or excessive quantities on hand.

Short Cuts FOR THE SMALL SHOP

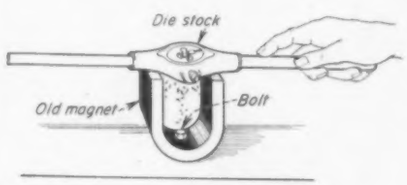
BY A. H. WAYCHOFF





TRAYS for small parts are easily made from fruit-juice cans. When removing the contents, punch holes in one half of the end, as at 1. Then cut the sides and ends as at 2. Spread the sides, and turn them under as at 3 to form supporting feet. Curl the feet to avoid cutting the fingers. This round-bottomed receptacle makes it easy to remove small parts without tipping the container.

CHIPS can be removed efficiently from die stocks by placing them on top of a strong magnet. A magnet from an old magneto will serve the purpose. Chips can be cleaned out of taps by the same method. When the magnet is covered with chips, a few vigorous strokes with a stiff brush will clean it.



A BURNT HAND and spilled babbitt can be prevented by applying a sliding grip to the ladle handle. Split a piece of scrap gaspipe, close it around the handle and wrap with asbestos tape, cemented in place with sodium silicate. The chemical is heat-proof. Slide the grip back to the T-end of the handle while melting babbitt. Then push it forward when ready to pour the bearing.

ROUND TABLE

Study It or Do It?

"Look, kid, you learned how to use a set of hand tools. Didn't the school teach you how to do shop math, and how to run machine tools? Well, then, you ought to be able to handle this job I picked out for you."

Ed turned from the student to see Al's quizzical smile. "You built that young Harper up to an awful letdown. He's only trying to learn something while he's here. Probably be your boss someday."

"I don't care if he is, Al. These students who came in fresh out of college, stay a month, then go to some other department, never will know anything about the shop. They're trying to substitute a college degree for the real thing."

"Remember, these student engineers have acquired a lot of worthwhile theory, and the company is only helping them apply some of it by sending them into the shop to get the 'feel of things.'"

"How can you get the 'feel of things' by studying books for several years, then working for thirty days? If I had my way, Al, these smart-aleck kids would go to work first and stay at it until they learned something practical. They could get all the 'books' they need by studying at home a few nights a week. I got my education that way, and I know more about the shop than these students will ever know, even if they keep going to school the rest of their lives."

"I don't underestimate your experience from working in the shop, but a few years' concentrated study *will* give a man an advantage. He might not have specific knowledge of machine tools that any shop-trained man has, but he can pick that up as he goes along, and in the long run can be more useful to us because he can use what he knows in so many more ways than we can."

"A pretty speech. You sound like one of them college professors givin' a talk at some graduation or other. Havin' your way would fill the place up with a bunch of intelligent observers. But what would they observe? Somebody has to do something so the observers have something to observe."

"Now you're talking about something else, Ed. I don't mean to sell short the value of working with your hands or to say that everyone can go to school and be a help to us. I know this shop has got to run and the boys in here every day do that. But we were talking about different kinds of education, shop or formal. When it comes to that, I say formal education is more effective, because shop knowledge can be acquired as needed. Sure, somebody has to do the work, but we were talking about students."

"You stick to your theories and me to my practice. My boy isn't going to learn how to run a lathe by going to school. He's going to learn it right here, the hard way"

AL'S GOT A POINT. *So has Ed. Where is your boy going to receive his training? What do you think is the proper procedure, shop or formal education? Are student engineers only a handicap? Other readers will appreciate your ideas. Discussions of earlier topics appear on later pages.*

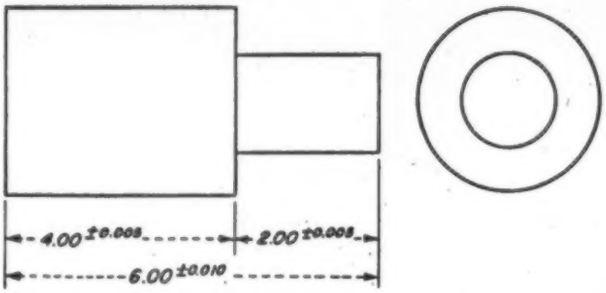


Fig. 1—Over-all length of a piece is obtained by adding intermediate lengths and tolerances: 4.00 ± 0.005 + 2.00 ± 0.005 = 6.00 ± 0.010

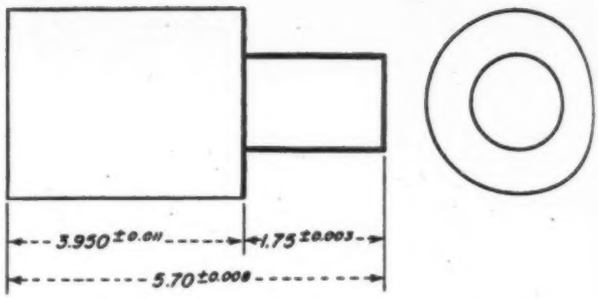


Fig. 2—An intermediate length is obtained by subtracting a gaged intermediate length from the gaged over-all length, but tolerances are added: 5.70 ± 0.008 — 1.75 ± 0.003 = 3.95 ± 0.011

TOLERANCE CHARTS FORECAST ACCURACY

BY JAMES K. MATTER, PIONEER ENGINEERING AND MANUFACTURING CO.

Whether a part can be machined to selected tolerance can be predetermined graphically by constructing a tolerance chart

OF ALL phases of cost reduction, none is of more importance than use of tolerance charts. These charts are not adaptable or necessary for all classes of work. But on splined shafts, fine gears, airplane-engine shafts and similar parts, they are invaluable—practically indispensable for economical production.

Tolerance charts prevent scrap by permitting the engineer to determine, in advance of tooling, whether the part can be made. If a complicated process passes the test of a tolerance chart, it is then safe to design tools to make the part. The tolerance chart is the first step; tool designing comes second.

20 Years Old

Tolerance charts of various types have been in use for at least 20 yr., although their use has been confined to a small circle of engineers. All too few understand their development, application and possibilities.

The tolerance chart represents a graphical method of presenting and examining the various machining operations proposed to be executed on a definite part, for the purpose of *predetermining* whether the part will arrive at the last operation with desired dimensions and tolerances.

It is easy to machine a shaft of several diameters, working alternately from either end, without graphing the operations first on a tolerance chart. It is a different matter, however, to machine an intricate splined shaft that requires ten or fifteen cuts and grinds, at both ends, and finish it to close tolerances without the use of a chart.

During the past war, I met many parts that couldn't be made—or so it developed—and only because no one had charted the correct method.

In one plant over a million dollars had been spent trying unsuccessfully to make a complicated mechanism. The basis of all trouble was in the body, on which it was necessary to perform over 100 operations.

The part was a forging of special steel with a main bore of many steps, and nine circumferential holes, also of many steps and lengths. Final dimensions were all in tenths or hundredths of thousandths. The part had to be machined first from one end and then from the other. It had to be rough-turned, semi-finish-turned, drilled, redrilled, reamed, bored, rough-ground, normalized, rebored, reground, nitrided, finish-ground, honed and lapped.

An engineer had struggled manfully to process the part, but unfortunately he knew nothing of tolerance charts and became hopelessly entangled in dimensions and tolerances when he attempted to carry operation tolerances from one end of the part to the other end. Many times he had prescribed dimensions and tolerances to exist after a cut when he was already under that dimension before he started the cut. After a tolerance chart was worked out, these errors were evident.

Tolerance Trouble

Fig. 1 shows a simple shaft of two diameters. One diameter is 4.00 ± 0.005 in. long, and the other is 2.00 ± 0.005 in. long. Adding together the two lengths and their tolerances algebraically gives a total over-all length of 6.00 in. ± 0.010 in. That principle of adding the tolerances is important and should not be forgotten. As long as each length is permitted to vary ± 0.005 in., the total length will vary the sum of the two tolerances, or ± 0.010 in.

Many men, untrained in elementary algebra, argue that over-all length will not vary according to the sum of intermediate lengths and their accumulated tolerances. Those men, of course, are wrong.

Fig. 2 shows a piece that, chucked in a lathe on the large diameter, was faced on the small end, turned on the small diameter and faced on the shoulder of the large diameter, as shown by the heavy lines.

The small diameter was machined

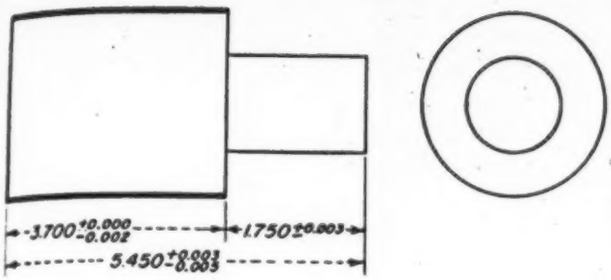


Fig. 3—When the large end of the part (Fig. 2) is faced, the new over-all length must be determined by adding dimensions and tolerances: (3.70 + 0.000 — 0.002) + (1.75 + 0.003 — 0.003) = 5.45 + 0.003 — 0.005

to a length of 1.75 ± 0.003 in., and kept within those tolerances. The over-all length was made 5.70 ± 0.008 in.

Length of the large diameter is found by subtracting the length of the small diameter and its tolerances from the over-all length and its tolerances:

$$\begin{array}{r} 5.70 + 0.008 - 0.008 \\ 1.75 + 0.003 - 0.003 \\ \hline 3.95 + 0.011 - 0.011 \end{array}$$

Note that dimensions are subtracted but tolerances are *added*. That is right—added. In dealing with dimensions and tolerances, whether adding or subtracting dimensions, tolerances must always be added.

The figure arrived at, 3.95 ± 0.011 in., can be proved to be correct. This figure is a resultant, not a gaged dimension. The part was faced to the dimension 1.75 ± 0.003. That is a gaged dimension, and the operator is permitted to finish it somewhere within those tolerances. Similarly, dimension of 5.70 ± 0.008 in. is gaged.

If the operator faces the piece to the high side, the over-all length would be 5.708 in. If he faces the length of the small diameter to the low side, then the length of the small diameter would be 1.747 in. Subtracting dimensions gives: 5.708 — 1.747 = 3.961, which is 3.950 + 0.011.

Consider the other extreme. If the operator turns the piece to the low side, the over-all length will be 5.692 in. If he now faces the small-diameter length to the high side, it will have a length of 1.753 in. Subtracting them gives: 5.692 — 1.753 = 3.939, which is 3.950 — 0.011 in.

These figures satisfy both extremes and prove that it is correct to add tolerances when dimensions are subtracted. If both dimensions are machined to the high limits or both to the low limits, the resulting figures stay inside the ± 0.011-in. tolerances.

In Fig. 3 the part is reversed and chucked on the small diameter. The large end is faced and the large diameter turned. To find the new overall-length, the two intermediate lengths are added:

$$\begin{array}{r} 3.70 + 0.000 - 0.002 \\ 1.75 + 0.003 - 0.003 \\ \hline 5.45 + 0.003 - 0.005 \end{array}$$

If the piece were to be finished to a different over-all length and closer tolerances held, intermediate lengths would have to be held to closer tolerances. Tolerance limits of any intermediate cut, on either end, must be considered and carried along when the part is reversed for machining. These tolerances, as already shown, *must be added*. They can never be dropped or ignored.

Construction of an actual tolerance chart will be explained for the workpiece in Fig. 4, a bronze rear-end cap of an Autosyn Motor. Tolerances and dimensions are those actually required and held. This piece is not too simple to be a good

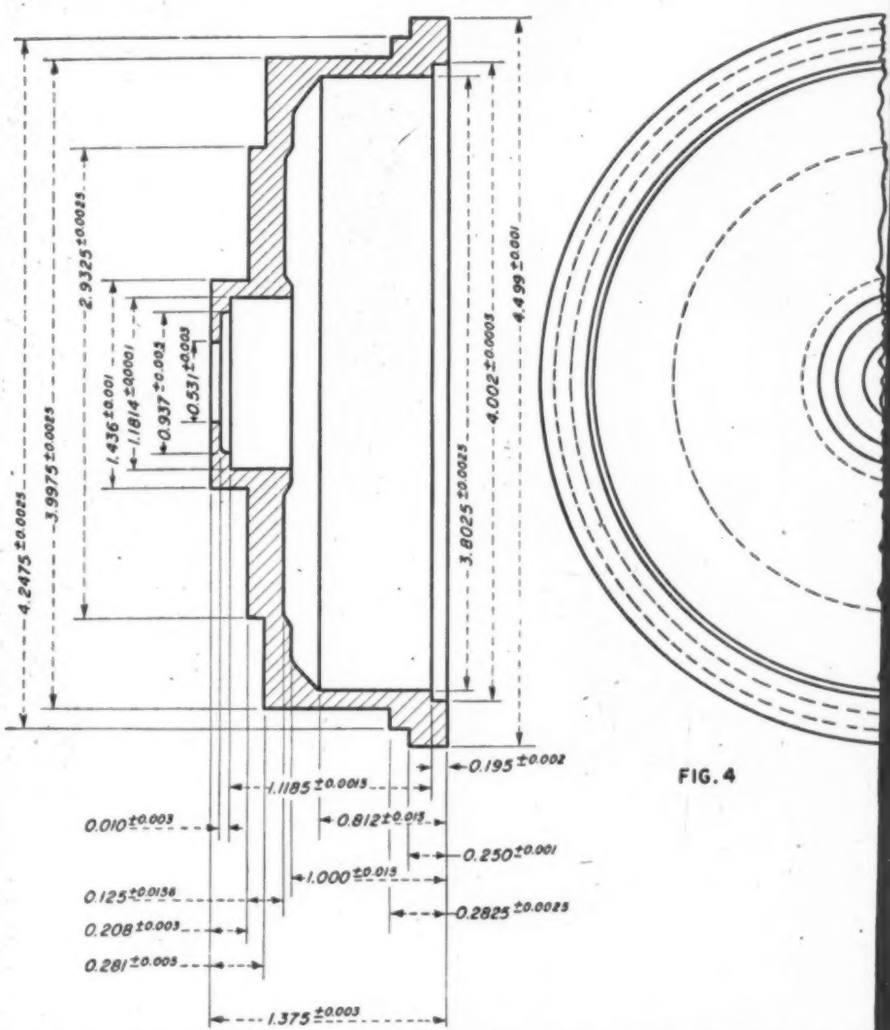


FIG. 4

Fig. 4—This rear-end cap of an Autosyn motor will be used to illustrate construction of a tolerance chart. Dimensions and tolerances indicate the complexity of the machining operation which consists of turning, facing and boring cuts from both ends

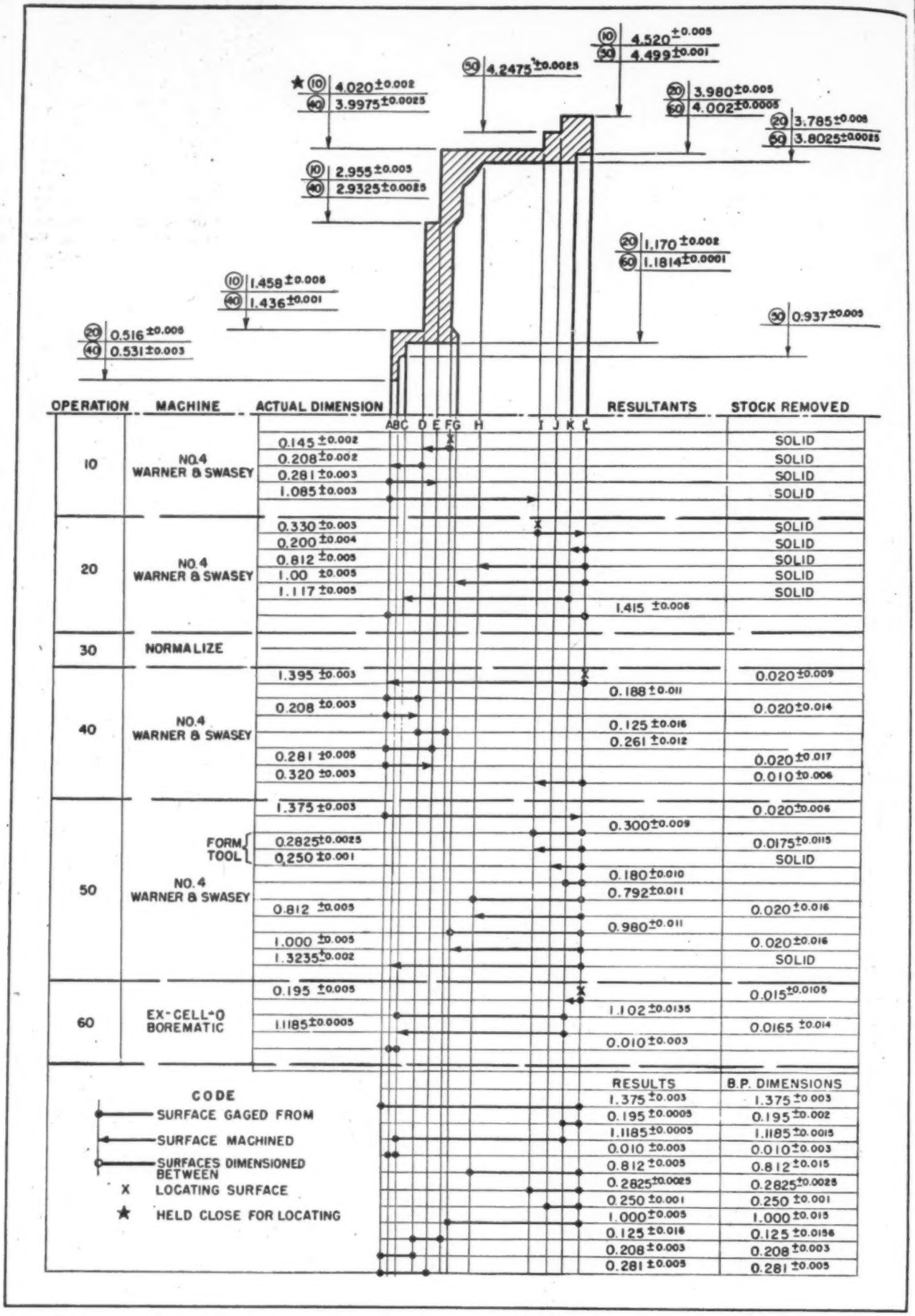


Fig. 5—The completed tolerance chart, here shown, gives step-by-step progress in machining operations. The summary indicates (1) how results obtained compare with results desired and (2) the part can be made to tolerance

example or too complicated to be understood; yet it illustrates all the principles needed to process the most complicated part.

Fig. 5 is the completed tolerance chart, with codes and legends added to make it more easily explained.

The first step is constructing a tolerance chart is to select a large sheet of paper and draw the cross-section of half the part at the top and center of the sheet. A line at the bottom of the cross-section is drawn from one side to the other.

This particular piece happens to be bi-symmetrical, that is, one half of it is identical with any other half. If the part had unequally spaced, stepped holes through it, then a section through one of these holes is pictured so it would show in the same plane as the cross-section at top of the sheet.

In other words, don't hesitate to distort the cross-section whenever necessary. That section is for reference only; it need not be to scale, but it should show all the surfaces to be processed and machined.

Body of Chart

After the sketch is made and the line drawn at the bottom of sketch, perpendicular lines are drawn down from every perpendicular surface that is to be machined. On the chart, these lines are lettered from *A* to *L*.

Other vertical lines are then drawn, such as under the words, OPERATION, MACHINE, ACTUAL DIMENSION, RESULTANTS and STOCK REMOVED. Finally, horizontal lines ¼-in. apart are drawn for figures representing the cuts.

In analyzing this part, it is observed that there is, in the vertical plane, one surface that is not to be machined. That surface is on the inside of the part and is marked *F* on the chart. Chucking on the inside permits locating against and gaging from that surface.

From machines available when this part was actually processed and the tolerance chart made, a #4 Warner and Swasey turret lathe was selected. Special jaws were made for the lathe. The end of these jaws bear against the surface marked *F*, also with an *X*, while they grip the part on the large inside diameter which finishes to 3.8025 ± 0.0025 in.

On the chart, a figure 10 is placed under word OPERATION as it is the first operation and the name of the machine is listed in its proper place.

The first cut is a facing operation on surface *D*. It is decided that after this operation, the thickness of the metal between surfaces *F* and *D* will be 0.145 ± 0.002 in. This figure is noted on the chart under the heading, ACTUAL DIMENSION. A heavy horizontal line is drawn to connect those two vertical lines.

The gaging or starting part is indicated by an enlarged dot, while the surface where the cut is taken has an arrow pointing to it. The dot shows that the cut will be gaged from that surface, and the arrow tells where the cut is being taken.

On the next cut, gaging is done from surface *D* and the outside end of the piece is faced to a dimension of 0.208 ± 0.002 in. Now, with the end surface *A* established, gaging is done from there for the two following facing cuts; one on surface *E*, held at 2.81 ± 0.003 in. from surface *A*, and one on surface *I*, held at 1.085 ± 0.003 in. from *A*.

Those four facing cuts are all that will be made on vertical surfaces in this operation. However, while they were being made, cuts were also made on horizontal surfaces. The smallest O.D. was turned down to 1.458 ± 0.005 in. The figure 10 in a circle signifies that this dimension was made at OPERATION 10. All O.D.'s were turned, and their dimensions noted on the chart just above the surfaces. The main O.D. was turned to 4.020 ± 0.002 in. A star placed in front of that dimension indicates that tolerances of ± 0.002 were held that closely for locating purposes on the next cut.

Dia. Tolerances Not Critical

The tool engineer or process man is seldom in danger of getting into trouble with his tolerances on diameters, so only the dimension arrived at and the tolerances held are indicated.

The part has now been rough-machined on the outside. No known resultants have been established yet, so none are listed on the chart. The stock removed has all been cut from a rough casting, so the term "SOLID" is set in that column. SOLID simply means cut from a rough, ungaged surface.

The part is now taken from one machine and then transferred to a duplicate machine which performs operation 20. The part is now held in a pot chuck, gripped on the 4.020 ± 0.002-in. O.D. and located against shoulder *I*.

The first operation is facing the open end of part, surface *L*. That dimension is held to 0.330 ± 0.003 in. with locating surface *I*. Right there is established the first resultant, shown at bottom of cuts in operation 20. On operation 10, a dimension of 1.085 ± 0.003 in. was established between surfaces *A* and *I*. Now there is established a second dimension between *I* and *L*, thereby causing a new over-all length to come into being. That length is obtained by adding together the dimension between *A* and *I* and its tolerances, and the dimension between *I* and *L* and its tolerances:

$$\begin{array}{r} 1.085 + 0.003 - 0.003 \\ 0.330 + 0.003 - 0.003 \\ \hline 1.415 + 0.006 - 0.006 \end{array}$$

From now on, these tolerances of ± 0.006 on the over-all length will have to be taken into consideration until they are changed. On this chart, they are termed resultants and put out in plain view where they cannot be forgotten or overlooked.

Operation 20 Completed

The rest of the cuts in operation 20 are all simple drilling and boring cuts. All dimensions established on inside diameters are shown above the horizontal line at the bottom of the cross-sectional view. All dimensions that affect the length of inside or outside horizontal dimension are shown opposite operation 20 and below the dividing line. It should be easy to follow them on the chart.

Operation 30 is heat-treating and not really necessary for the purpose of this chart. It is listed, however, to maintain the operation sequence. All those beginning to use tolerance charts are advised to do the same.

In this operation no cutting is done. The part is simply heated and cooled slowly. Warpage occurs during normalizing, which must be followed by finish-machining.

Machining is again started on the outside of the part, but this time the treatment is slighly different. Chucking is done on the inside of the part, locating from, and banking against, the open end, vertical surface *L*. Gaged from that end, the small end of piece is faced to a new over-all length of 1.395 ± 0.003 in. This operation is noted on the chart. This new dimension and its tolerances are subtracted from the last over-all dimension and its tolerances:

$$\begin{array}{r} 1.415 + 0.006 - 0.006 \\ 1.395 + 0.003 - 0.003 \\ \hline 0.020 + 0.009 - 0.009 \end{array}$$

As always, in subtracting, tolerances are added. The subtraction is

made for the best reason in the world, that is, to find out whether there was stock enough to make the cut. Had the subtraction given 0.020 ± 0.021 in., the dimension might have been 0.001 in. undersize before the cut was started. Keeping track of stock removed, as machining is done, and keeping track of resulting dimensions after every cut are two of the main advantages of tolerance charts.

When the small end was faced, a new resultant was also set up between surfaces *A* and *D*. To find what that dimension is, the material removed is subtracted from the old dimension:

$$\begin{array}{r} 0.208 + 0.002 - 0.002 \\ 0.020 + 0.009 - 0.009 \\ \hline 0.188 + 0.011 - 0.011 \end{array}$$

Now that this new resultant is established, it is immediately gaged from and changed again. Surface *D* is faced to a dimension of 0.208 ± 0.003. To find the stock removed this time, the old dimension is subtracted from the new:

$$\begin{array}{r} 0.208 + 0.003 - 0.003 \\ 0.188 + 0.011 - 0.011 \\ \hline 0.020 + 0.014 - 0.014 \end{array}$$

Besides creating a new dimension between *A* and *D*, a resultant dimension is created between *D* and *F*. To find what this dimension is, the stock just removed is subtracted from the original dimension from operation 10:

$$\begin{array}{r} 0.145 + 0.002 - 0.002 \\ 0.020 + 0.014 - 0.014 \\ \hline 0.125 + 0.016 - 0.016 \end{array}$$

When the small end was faced at the beginning of operation 40, another resultant was created between *A* and *E*. To find this dimension the original figure is taken from operation 10 and the stock removed subtracted from it, thus:

$$\begin{array}{r} 0.281 + 0.003 - 0.003 \\ 0.020 + 0.009 - 0.009 \\ \hline 0.261 + 0.012 - 0.012 \end{array}$$

This figure is immediately changed again by taking a facing cut on surface *E* and gaging it to a new dimension of 0.281 ± 0.005. To find the stock removed, the two dimensions are subtracted:

$$\begin{array}{r} 0.281 + 0.005 - 0.005 \\ 0.261 + 0.012 - 0.012 \\ \hline 0.020 + 0.017 - 0.017 \end{array}$$

Note how the tolerances have pyramided. That operation is as close to the danger line as it is safe to go. If preceding operations had gone to the low side and if this operation had gone to the high side (a condition which often happens), there would have been only 0.003 in. of stock to remove at this cut.

One more cut is made on this operation, facing surface *I* to a directly gaged dimension of 0.320 ± 0.003. To find the stock removed the new dimension is subtracted from the old dimension established in operation 10:

$$\begin{array}{r} 0.330 + 0.003 - 0.003 \\ 0.320 + 0.003 - 0.003 \\ \hline 0.010 + 0.006 - 0.006 \end{array}$$

At the worst condition, there is + 0.004 in. of stock to remove, so this operation is all right.

In operation 50, the part is reversed again and chucked on the main O.D., banking against, and locating from, the small end. On the first cut, the large end *L* is faced, thereby establishing a new and final over-all length and also several resultants. The stock removed is first found by subtracting the old and new lengths in the usual manner —subtracting dimensions and adding tolerances. This figure is found to be 0.020 ± 0.006 in.

The resultant between *I* and *L* is found by subtracting the stock removed from the dimension established in operation 40 between these surfaces:

$$\begin{array}{r} 0.320 + 0.003 - 0.003 \\ 0.020 + 0.006 - 0.006 \\ \hline 0.300 + 0.009 - 0.009 \end{array}$$

To economize on tools, vertical outside surfaces *I* and *J* and the two largest O.D.'s are machined at one time with a form tool held in the square turret. Results and stock removed are ascertained as in previous cases illustrated. The rest of the chart can be followed in the same way.

At the foot of the chart, a comparison of results obtained with results desired is shown. This comparison is always desirable.

Do's and Don'ts for Charts

We believe that from a careful study of this article an engineer should be able to construct a tolerance chart for a much more elaborate part and be sure that it reaches its final cuts with enough material left to make the part. The following *do's* and *don'ts* are essential to good tolerance charts:

1. Do use a large sheet of paper to construct a chart of this nature.

2. Don't hesitate to distort the top cross-sectional drawing in order to help the chart. For instance, if an O.D. vertical and an I.D. vertical dimension exactly coincided, distort them out of line so they will not confuse you in processing the part.

3. Don't forget that tolerances are always added. In determining stock removed you subtract dimensions but you add tolerances. There will be plenty of people who will argue that tolerances should be subtracted. Don't ever try it. There are still folks working on perpetual motion.

4. Don't forget that if you make a mistake and finish up with a stock removal of 0.012 ± 0.017, or some similar figure, you will have to go back and take off less stock earlier in your process. The cut you propose to take must, and we mean MUST, be greater than the tolerances you are carrying with the cut. There are absolutely no exceptions to this rule.

5. Don't hesitate to use red lines for your cuts and green lines for your resultants, if use of colored lines helps your technique. Many engineers resort to colored pencils and find that it helps them.

6. Don't forget to put down your resultants, and figure them properly. After several operations on a complicated part, resultants are caused by nearly every cut. If they are ignored, the chances are they will crop up later to spoil the process.

7. Don't forget that tolerances pyramid from one end to the other; when several dimensions are overlapped (and they always are), you will have to hold your tolerances small enough so they stay within the limits you want.

A tolerance chart of this part, or any part, can be constructed backwards. Some engineers, but not many, find it easier to begin with the answer and work back to the start of the operations.

Just as in constructing the chart shown, machines are first selected and surfaces to be machined in operation 10 are determined. Locating points are established, and cut arrows and connecting lines are drawn in but no figures are put down. The part is reversed; locating points are again established and all lines and arrows drawn in.

The same is done throughout the whole process for all machines and operations. Then starting at the end, the proper amount of stock is left for each cut as the chart is filled in backwards for the answer.

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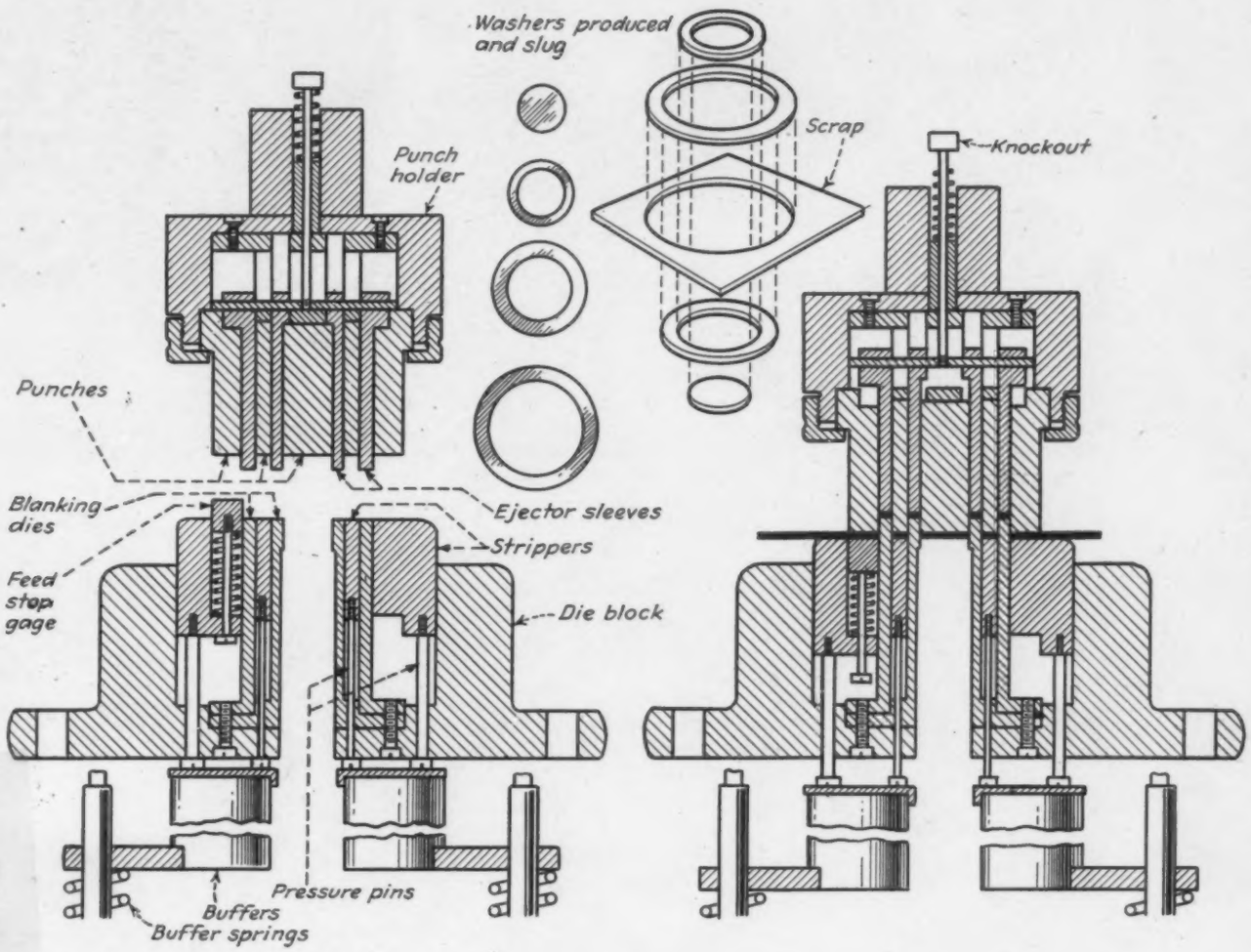
Practical Ideas



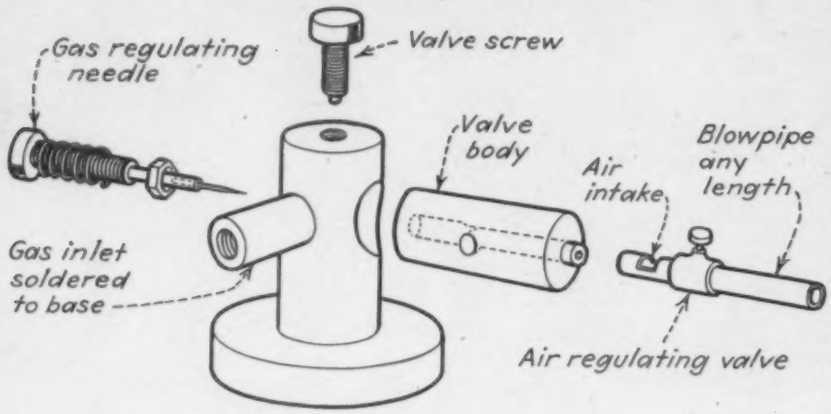
Compound Punch and Die Makes Three Washers

With three concentric punches fixed in the punch holder, two concentric sleeve dies in the die block, two concentric ejectors between the punch sleeves, and two stripper sleeves mounted on a pressure pad, this unit produces three washers and a slug at a single stroke of the press.

The outer punch sleeve, which cuts on its I.D. only, is seated firmly in a groove in the punch holder and held in place with a screw-on ring. The intermediate punch and the solid punch in the center are integral and screwed to the bottom of the punch holder. The ejector sleeve and knockout assembly is arranged to slide freely between the punches, and a spring holds the ejectors in a retracted position when at rest. (In the drawing, the knockout projects too far from the punch holder as it is supposed to eject the two washers only when the press ram reaches the top of its stroke. The spring is intended to balance the weight of the ejector-knockout so washers won't drop out accidentally.)

The strippers, which hold the stock and remove both the pierced stock and the intermediate washer, are held in place with buffers and helical compression springs. The solid slug falls through the center die. All punch and die surfaces are sharp except the O.D. of the outside punch. A feed stop gage aids in locating the stock and an automatic sorting device, consisting of "go-not go" holes, conveys the washers to tote boxes already sorted.

This die was designed to cut cardboard washers from 1/16 and ⅛-in. stock but would work equally well on thin metal. Air blasts work well to transport the washers into the sorting tumbler. *Burnett Menkin, Bronx, N. Y.*



Bunsen Aids Small Brazing

Quickly made from brass barstock and standard tubing, this burner has a range of adjustments that will adapt it to a variety of soldering, brazing and small heat-treating jobs. The valve body has a restricted orifice at its outer end which forms the seat for the spring-loaded adjusting needle. Air is entrained at the base of the blowpipe and this can be adjusted in proportion to the gas flow with the small covering collar. An extension or secondary blowpipe tube can be added for particularly inaccessible jobs, or a piece of flexible tubing to hold the flame at any angle desired could be substituted. *Norman Laycock, Surrey, England.*

Form Turning Attachment—Simple profiling of many kinds can be performed most quickly in a lathe by first making a sheet metal or hardwood templet and then mounting a simple follower on the cross slide. For making one or two pieces only, a wooden templet will suffice even for fairly close work. For production jobs, the whole lathe carriage can be made free sliding, fitted with transverse counterweights heavy enough to keep the tool cutting as deep as the templet and follower will permit as longitudinal feed is actuated with a lever. *Donald A. Baker, Boonton, N. J.*

Lathe Fixture Slots Screws

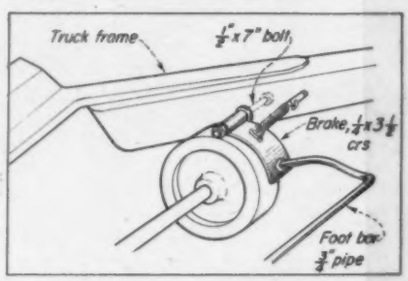
Continuously threaded but cut-to-length screw stock is loaded in batches of 8 pieces between the split plates of this lathe mandrel, cleaned up and slotted with a parting tool.

Work is loaded by adjusting the plate clearance to a loose running thread fit so the blanks can be spun in quickly and then the plates are tightened with the lock nuts to grip the work securely and prevent any slippage during the cuts. The mandrel is unloaded by opening the plates up wide so the finished screws can fall into a tote box.

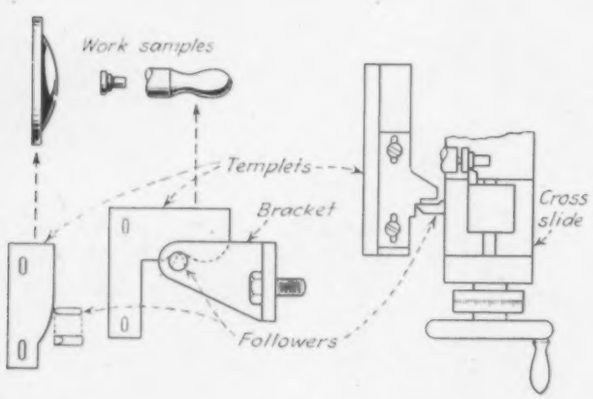
The plates were constructed by interposing a temporary brass spacer (to allow for subsequent clamping) while the holes were drilled and tapped with a portable electric tool mounted on the lathe carriage. *George Burnley, Oakland, Calif.*

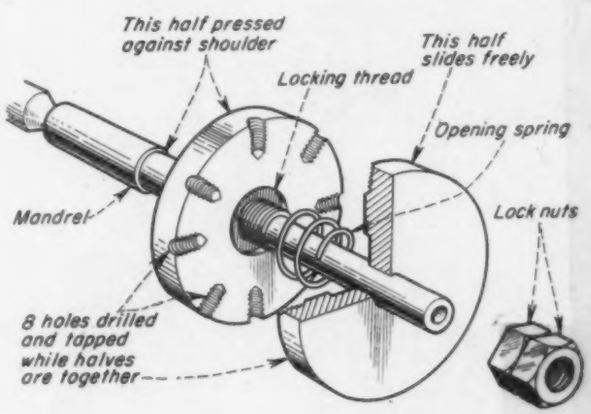
Brake Prevents Kick-Back

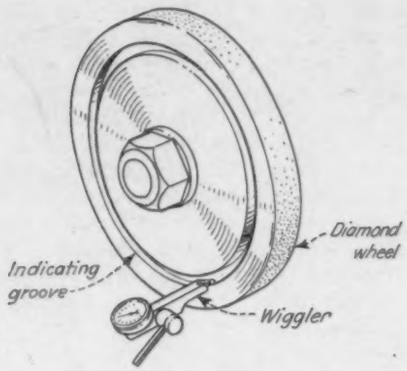
Hand-truck safety has been greatly and permanently improved with the addition of this foot brake, built from scrap. Wood blocks or wedges were sometimes used but they were usually not available when needed, and the substitutes were more dangerous than nothing at all.



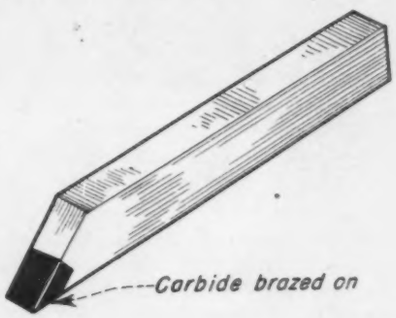
Light springs keep the shoes off the wheels when rolling. *Thomas H. Duffy, Altoona, Pa.*



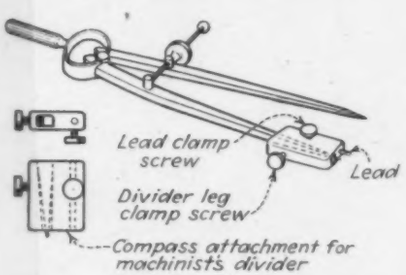




Centering Diamond Wheels—A ¼-in. groove carefully turned in a lathe in the aluminum body of diamond wheels makes a permanent place to use a dial indicator for centering on a machine without contacting the abrasive surface itself. *Norman Ingalls, Flint, Michigan.*



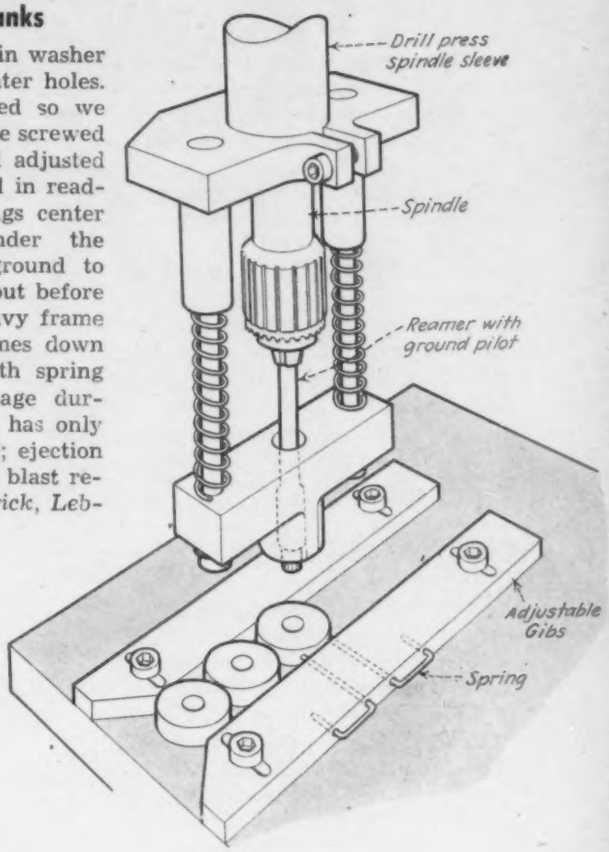
Carbide Scriber—Height gages will last almost indefinitely when equipped with a brazed-on carbide scriber-tip. A fine, sharp line is produced on sand-blasted steel castings, heat-treated forgings and finish-milled work alike even when the scriber is ground with a 45° point (for greater strength). *Frank A. Bynum, Duncan, Okla.*

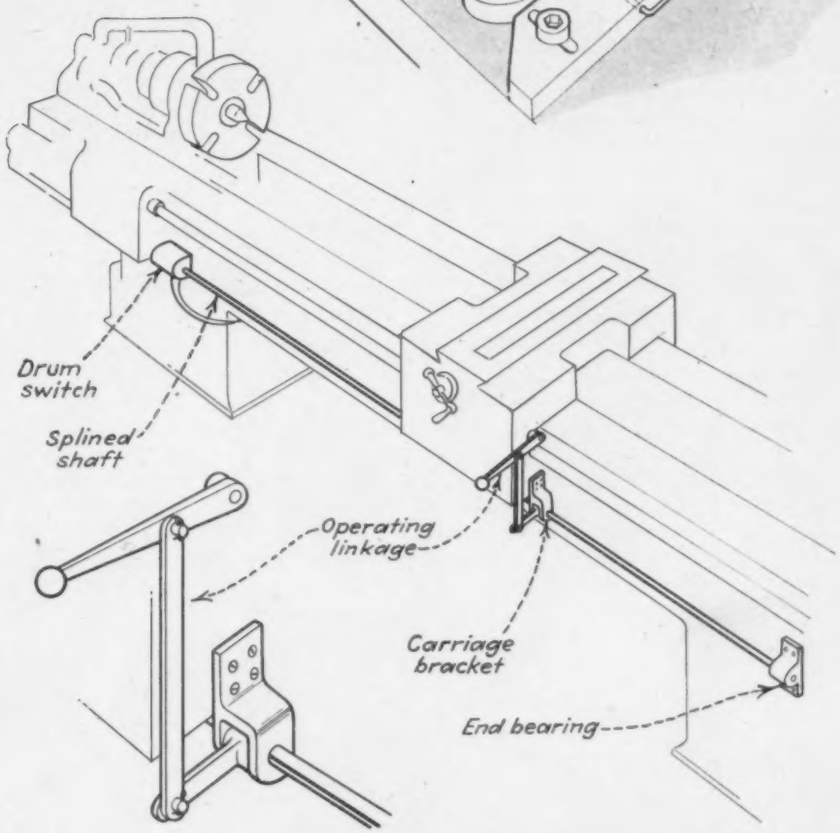


Compass Attachment for machinist's dividers consists of a small block of metal fitted to one divider leg and clamped with a setscrew while a parallel hole positions the lead. This is easy to make, takes up little space, and saves money. *James D. Cuyler, Pelham, N. Y.*

Drillpress Reams Gear Blanks

Brass spur gears, blanked in washer dies, required accurate center holes. Our equipment was limited so we built this fixture. Ways were screwed to the drillpress table and adjusted to allow the blanks to feed in readily. A couple of rod springs center each blank roughly under the reamer. The reamer is ground to pilot itself into the work, but before there is any cutting, a heavy frame surrounding the chuck comes down and clamps the blank with spring pressure, preventing slippage during reaming. The operator has only to keep the blanks feeding; ejection takes care of itself. An air blast removes chips. *James Broderick, Lebanon, N. J.*





Carriage Lever Operates Old Lathe

Conversion from overhead countershaft to individual motor drive on a large engine lathe involved the mounting of a drum switch for motor control. This machine had a long bed which made the positioning of the switch for safety and convenience something of a problem.

Our solution was a slender shaft with a single full-length keyway which was mounted directly under the ways and behind the carriage apron. This shaft extended the full length of the lathe bed and was supported at the ends only. The drum switch was placed in line with the shaft at the headstock end and coupled to it. To the lathe carriage an operating lever was mounted in the most convenient position for the operator and this was connected by means of a drag link to a keyed collar which fitted the shaft loosely.

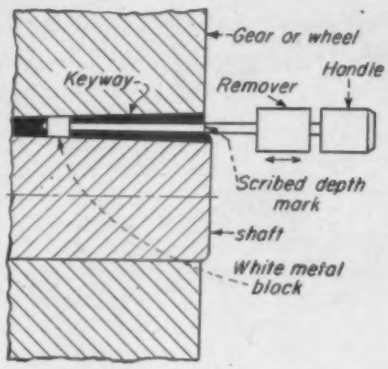
Now, regardless of the position of the carriage along the bed, the motor switch is always immediately at hand. *K. Wysocki, Maywood, N. J.*

Shaper Doubles As Punch Press

Recently we had a small job which called for forming several hundred parts into square frames. A standard die would have been too expensive for the quantity reuired; besides all our presses were engaged in regular production.

We shaped the male and female V-block dies, fastened the male to a piece of steel clamped in the shaper vise, and fastened the female die to a block secured to the clapper.

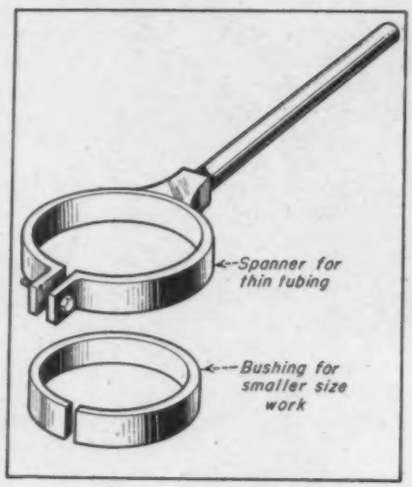
This method was found to be so satisfactory that we have used it subsequently on a wide variety of work. The swinging of the clapper is not objectionable on most work, but for piercing, this must be eliminated. *Felix J. Zagumny, Detroit, Michigan.*



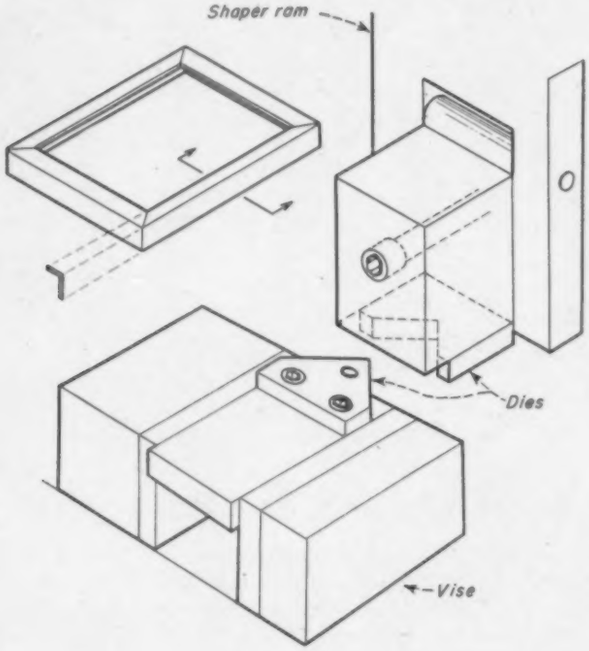
Tapered Key Fitting — Cut-and-try has been eliminated when new tapered keys are required by gaging the keyway in assembled parts with a block of soft metal. A convenient tool can be made up quickly using a steel rod which will fit to the bottom of the keyway easily and building up a lead block by dipping the rod repeatedly into a hot ladle. After driving the rod well into the keyway, scribe a mark on the rod flush with the work surface to get the length, then withdraw the rod by tapping with the loose block previously slipped on the rod. Now, measurements at the keyway opening combined with the lead block measurements provide the necessary data for making a perfect key. *U. Wheatley, N.S.W. Australia.*

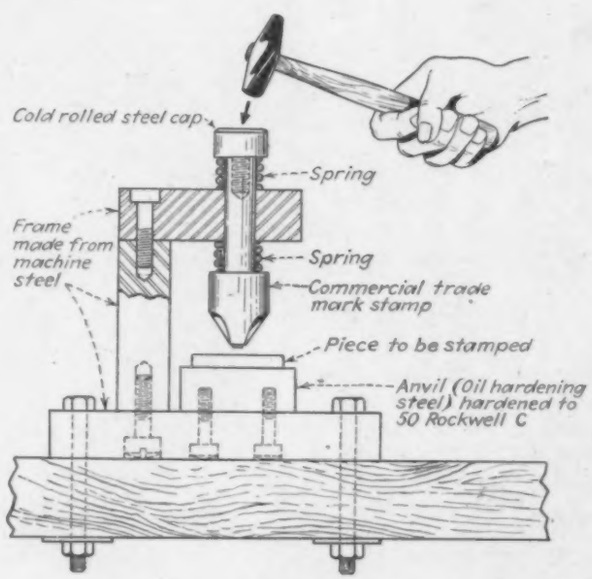
Hand Burr—A medium-cut, spherical-ground rotary file in a wooden handle has proved convenient for burring the edges of all kinds of drilled holes. *T. C. Clark.*

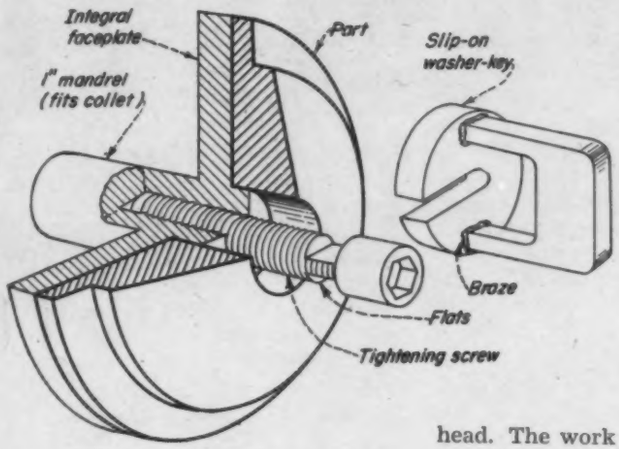
Lens Spanner — Thin tubing lens mounts and other instrument frames with their very fine pitch threads sometimes become stuck or corroded in place and it is almost impossible to loosen them without crushing or seriously marring the thin metal. This spanner does the trick very nicely, and by means of bushing inserts, some smooth, some knurled, any size and kind of work can be accommodated. *George Burnley, Oakland, Calif.*



Trade Mark Stamper—When one mark has to be applied to a variety of parts a punch press is unsuitable because of irregular size. This punch jig provides a simple means of producing uniform markings at a rapid rate regardless of size or thickness of the part being stamped. *Stephen M. Lounsberry, Jr., Oswego, N. Y.*




Cold rolled steel cap
Spring
Frame made from machine steel
Spring
Commercial trade mark stamp
Piece to be stamped
Anvil (Oil hardening steel) hardened to 50 Rockwell C

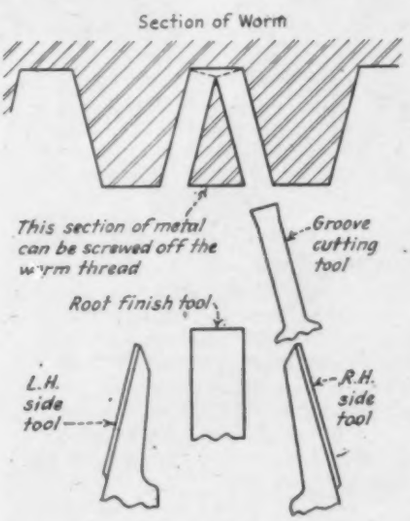


Colleted Faceplate Has Quick Lock

Second operation jobs such as this require fast relocating and clamping, especially in high-production runs. This part required a final turning after relocating from the center hole and the back face so a faceplate-mandrel was turned up to fit into a 1-in. collet.

The mandrel stub was center-drilled and tapped ¼-20 to take a (hardened) socket capscrew, ground flat on two sides as shown. A slotted C-washer was made to slip over the flats and to this was brazed a key, cut away to clear the screw head. The work is placed, the screw spun in until the washer just slips on, and the key is used to tighten. Work is removed by backing the key a quarter-turn and removing the washer.

We have turned the diameter within half a thousandth at a rate of 350 per hr. using this device. *Richard E. Stern, Maywood, Ill.*


Section of Worm
This section of metal can be screwed off the worm thread
Groove cutting tool
Root finish tool
L.H. side tool
R.H. side tool

Acme Thread Cutting can be improved by cutting the two walls first to full depth with a narrow cut-off set at the proper angle. After this, the triangular, helical core can be "unwound" from the screw and time and power to reduce it to chips is thus saved. Three finishing tools complete the work in one cut apiece. *Frank H. Schwerin, Pittsburgh, Pa.*

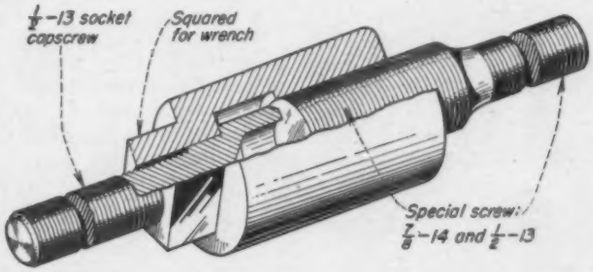
Removing Taper Pins—The rounded small ends of installed taper pins are easy to peen over, making removal difficult. Drilling a hole in the end of the pin before assembly makes it easy to start a punch when necessary to remove the pin. *William Henry Smith, Old Greenwich, Conn.*

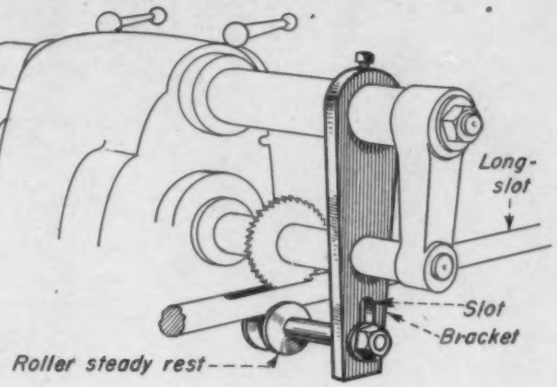
Coupling Feeds Tailstock

Very close and accurate work can be done in the tailstock using the carriage power feed and this coupling to slide the tailstock along the ways. Making use of the hole already tapped in the carriage for a follower rest, we transferred this hole to a parallel spot on the tailstock witn a transfer screw punch, and tapped it to match the carriage hole thread.

The coupling requires two pieces. One is a tubular member, clearance-drilled at one end to pass a standard socket capscrew with a minimum of play, and tapped ⅞-14. The O.D. is squared for a wrench. A special screw is made to fit the tapped hole in the coupling and to fit the tailstock tapped hole, which is the same as the carriage hole (½-13).

An Allen wrench drives the socket screw all the way into the carriage with the coupling sleeve in place. Then the special screw is started in the coupling and in the tailstock and wrenched until the special screw is all the way into both members. *Allan B. Nixon, Springfield, Mass.*

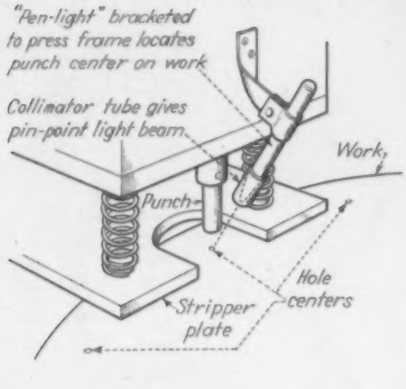




Steadyrest Aids Long Slot Milling

Key slotting and splining on long shafts can be simplified by installing a simple steadyrest to support the shaft directly under the cutter as it feeds long. In some cases, work of this nature would be performed with the shaft mounted right on the machine table straddling one of the T-slots, but situations occur where this setup is not possible, especially in extremely light rods which would be impossible to keep straight by other means.

The bracket slips over and mounts rigidly to the overarm, and for convenience slips over the arbor too, although there is no contact at this point. The roller is just a small V-sheave which is a loose fit on the adjustable stub extending from the bracket. *H. Moore, Leeds, England.*



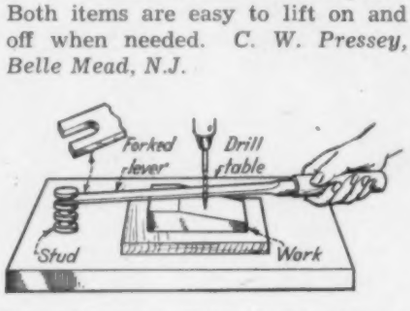
Light Beam Spots Hole Center

Occasional punching where a standard setup would be too costly can be effected with the aid of a collimated flashlight. Work is laid out as for drilling, but this time-consuming operation is eliminated.

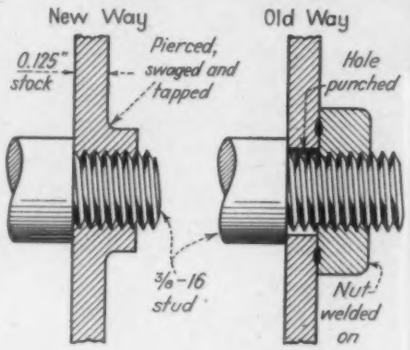
Instead, a flashlight, equipped with an extension cap having a small hole, is bracketed to some fixed part of the press. The small hole holds back all light except a single narrow ray, and this is adjusted by bending the bracket until it comes directly over the center of the hole, previously located and marked. Parallax corrections are necessary when changing work thickness. *Lawrence L. Hausman, L. I., N. Y.*

Low-Cost Turret—Ever wish you had a tailstock turret for that 16-in. or 18-in. lathe without spending 18-in. lathe prices?

Machine a 10-in. long slab of steel or cast iron (even aluminum works) to fit the ways of your lathe. Align two ⅜ by 1½-in. strips of gage stock and set an inexpensive small turret tailstock on it and go to work. Total cost less than $100.00. If you make your finished piece 2 or 3 in. longer and then cut it off you will also have a base for small steadyrest. Both items are easy to lift on and off when needed. *C. W. Pressey, Belle Mead, N.J.*



Irregular Part Holder—Odd-shaped pieces which are difficult to put in a vise or clamp in other ways can be held safely with this forked lever. The stud screws into several convenient locations on the table and steps provide for different work thicknesses. *A. D. N. Scott, London, Ontario, Canada.*



Swaging Eliminates Welding

Production assembly of heavy studs to relatively thin sheet metal is a problem, especially when the studs must be removable. Formerly, the connection was made by punching a hole and welding a nut in place. This was tricky as nut alignment both axially and laterally was hard to control, and welding flash was both messy and damaging to the nut, not to mention the cost of the operation.

A new press operation, which pierced and swaged the hole to accurate tapping diameter, accurately centered, solved the difficulty. *George Thomas, Feeder Div., Westinghouse Electric Corporation, East Springfield, Mass.*

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How to Enter—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St., New York 18, N. Y.

Thirty-eighth Selection—Wallace C. Mills' Threads for Thin Tubing

NEWS OF METALWORKING

Marshall Plan Likely to Produce U. S. Controls on Materials, Uses

WASHINGTON — The American businessman who believes Congress will sanction the Marshall Plan can look forward to two things—demands for greater production and regimentation.

The $20 odd billion tally of U.S. goods that the Marshall Plan countries have asked for add up to resumption of governmental controls over distribution, use and export of a wide range of commodities.

This means a return to materials allocation, using some of the techniques of the wartime CMP (Controlled Materials Plan). CMP took three years' to perfect. No one in government can see any but a wartime-type of rein that will hold together the economy under the strain of the Marshall Plan.

Under the CMP-type plan, the heart of the control framework would be a requirement screening board. Representatives of economy, both government and civilian, would split the U.S. production pie.

Three Categories

Control machinery to make possible the heavy volume of exports, and at the same time give the customers at home and the rest of the world enough to keep going, would be broken down into three categories. They would consist of export licenses, allocation of scarce materials, and control over the use of these.

Export controls would include "program" and "selective"' clearance through customs. The "program" clearances would be automatic for much of the Marshall Plan commodity lists. The "selective" clearances would cover what exports, outside of the Plan, industry would be allowed to make to old customers in other parts of the world.

Control over scarce materials, and supervision of their use, would imitate the "L" (Limitation) and "M" (Conservation) orders worked out during the war. In addition, an allocation system would often specify which consumers would get how much of a material for a specified use.

Who would do the controlling? At present the Dept. of Commerce, through its Offices of Materials, Distribution and International Trade, is administering the tag ends of wartime controls similar to those seen necessary to facilitate the Marshall Plan.

Most of the administration's remaining wartime powers, contained in the second Decontrol Act of 1947, are due to expire Feb. 29. These include:

360 Classifications

Export controls over some 360 classifications of commodities, adminstered by OIT.

Allocation and "use" controls over tin, antimony, cinchona bark, quinine and quinidine, by Office of Materials Distribution.

General export preferences for materials required to expand or maintain production in foreign countries of materials critically needed in the United States.

Export priorities for materials, except foods, manila and agave fiber and cordage, and fertilizer, which are certified by the secretary of state to be of "high public importance and essential to the successful carrying out of the U.S. foreign policy."

Whether or not the Commerce Dept. should continue as the control agency is a moot point at present.

The old-line government agencies argue that the present machinery would be adequate for administration of future controls. Others in Washington—politicians and businessmen—shy away from administration by the permanent bureaucracies. They advocate, instead, a new, separate and temporary central agency.

All concerned, however, are united in wanting unified control, rather than split control.

Domestic economy controls would be many and varied, depending on the scope of the Marshall Plan as sanctioned by Congress. However, those controls, already apparent, include continuation of present reins on tin, antimony and fibers, reimposition of use controls on steel, lead and cadmium—and wartime-type priorities for both finished goods and basic raw materials. Control of one commodity would lead to paralleling controls on component items or end products.

Iron and Steel Discussed

The most sweeping control being discussed in Washington would affect distribution and production of iron and steel. There is tentative talk of the government taking a hand in the steel industry's informal allocation systems. Moves to increase production in tight steel products, such as sheet and strip, by concentrating orders for particular grades and sizes in certain mills, as was done during the war to permit long, uninterrupted runs, are also being thought about.

No one in government can foretell how extensive the Marshall Plan controls will be. The utlimate mechanism will depend entirely on the final, congressionally-sanctioned scope of aid.

But, Washington officialdom is already girding for action. Former WPB specialist personnel are being polled on the availability.

The Paris report on the needs of the Marshall Plan countries does not answer questions which have been perplexing American industry.

But the wordy document does betray, in the way it uses dollar totals for items that ought to be in tons and bushels, that it was drawn up from quickly available statistics. Be fore it came to this country it became a compromise between what Western Europe figured was necessary and what the State Dept. thought Congress would accept.

The Paris thesis is now being studied by the Harriman committee of citizens and by interested government agencies. The report will be closely examined, rescaled to look better to Congress, and perhaps be rewritten.

D. N. Macconel was elected president of the American Machine Tool Distributors' Association at the recent Machine Tool Congress in Chicago. He is president of Machinery Sales Co., Los Angeles

Gaging Business

Metalworking Operations Climb

Metalworking operations throughout the country have climbed up to higher levels following the summer dip. It is the same old story—not enough materials, particularly steel, to go round. The shortages in castings and component parts are not so severe as they were, but still are a source of worry.

Chicago Labor Tight

The situation at Chicago is typical of many other parts of the nation. Employment in metalworking plants is at the year's peak. The labor shortage, moreover, shows no signs of easing and factories are running into competition from non-manufacturing employers. At the same time, new industrial construction continues to grow. Westinghouse will start immediately to build a plant to make equipment used by public utilities. International Harvester will spend $5 million to modernize its West Pullman works. Allis-Chalmers is making an outlay of $25 million for its tractor division alone.

Foundries Lack Materials

Pig iron, coke and scrap shortages are seriously affecting gray iron foundries. The outlook is not too bright, with continued heavy demand for all kinds of iron and steel products using all available raw materials. Foundries are currently operating with a 60-90 days' backlog.

Machine Tool Sales Improve

Machine tool buying took on new life just before the Machine Tool Show and has continued to show improvement ever since. Substantial orders were placed at the Show. One exhibitor, for example, sold all of its machines on display at the show and booked considerable business besides.

Industry shipments are believed to have turned up from the summer low, and cancellations have dwindled steadily from the year's high point last spring. Foreign sales still are curbed by dollar restrictions, but the dollar volume in ratio to total machine tool orders is staying somewhat above the prewar proportion of 20%. Export shipments by the industry are averaging close to 27% of builders' output.

Special Machines in Demand

Makers of special-purpose machine tools say that backlogs run up to a year. Deliveries on many standard machines, by contrast, can be made in three to six weeks. The automotive market looms impressively as an outlet for new machines, because of retooling programs and of the need for lowering costs. Expense of retooling is so high, however, that some Companies have postponed programs which they had intended to go through with this fall.

Automotive Shutdowns Brief

It still is likely that 5 million cars and trucks will be assembled in the United States and Canada this year. If no serious labor troubles occur and steel is available, a 10% better performance is promised for 1948.

Shutdowns for changeovers are brief this year. Hudson will be completely closed for only one week and partially down for four or five weeks. Packard did not suspend operations at all. It is reported running old and new models down the same line, cleaning up inventory on '47 cars while getting stocks into dealers' hands of '48 models.

Hudson and Packard First

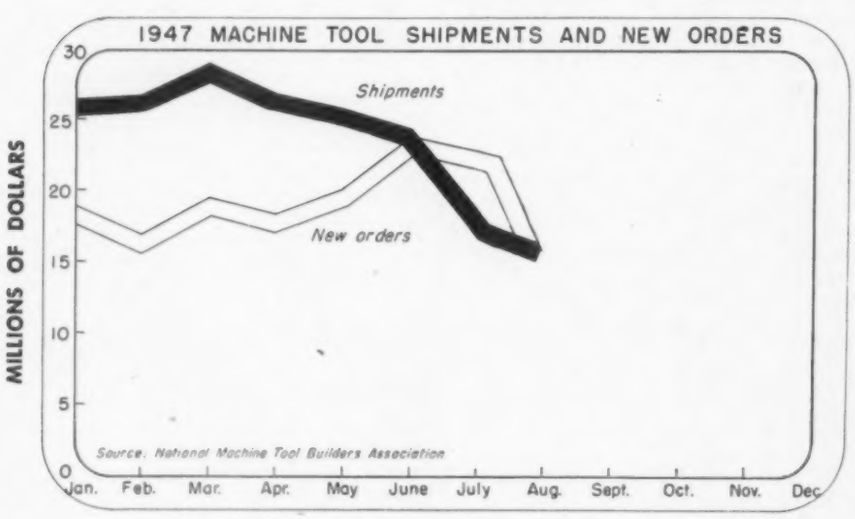
New cars for 1948 fall into this pattern: Hudson and Packard will be first. General Motors will come along early next year, but only Cadillac, Buick and the big Oldsmobile will be much different from current models. Ford trucks will be introduced in December or January, with Lincoln, Mercury and Ford following about a month apart. Automotive industry hopes to get a bigger supply of sheet steel after Great Lakes Steel completes its mill expansion and some 90% of its output will consist of automotive sheets.

Tool and Die Orders Up

Business is beginning to look up in the contract tool and die trade. The increase is not great; but the trend is now in the right direction. Hours worked per man are up from the midsummer low and production has recovered from July's bottom figure for the year.

Tool Shop Employment Expands

The six-months' downward trend in contract tool and die shop employment has been reversed. Backlogs are alarmingly low in many shops, but the situation is expected to ease shortly. Special tooling is providing most of the work for shops these days. Special machinery comprises much of the business in such centers as Syracuse, N. Y., St. Louis, Cleveland and New Jersey.



1947 Machine Tool Production

(Thousands of Dollars)

Month	Shipments	New Orders	Cancellations	Unfilled Orders
Aug. 1946	$26,911	$26,261	$4,461	$182,439
Jan.	26,542	18,991	1,503	154,760
Feb.	26,765	16,780	1,760	146,145
Mar.	29,012	19,509	1,436	137,175
Apr.	26,857	18,220	1,820	128,830
May	25,791	20,018	4,989	121,155
June	24,383	23,810	2,005	120,268
July	16,843	22,227	1,243	124,155
Aug.	18,520	16,037	976	122,854
8 month Total	194,713	155,592	15,732	
	FOREIGN			
Aug. 1946	5,498	5,881	544	53,733
1947				
Jan.	7,176	5,573	266	46,370
Feb.	6,085	4,152	972	43,787
Mar.	7,695	5,268	347	40,999
Apr.	6,365	4,896	210	39,294
May	6,244	4,242	225	37,610
June	5,680	4,505	315	36,766
July	4,781	4,570	369	35,782
Aug.	4,702	3,772	291	34,542
8 month Total	$48,708	$36,978	$2,995	

SOURCE: National Machine Tool Builders Association

Farmers to Feel Equipment Pinch Under Aid Plan

WASHINGTON—Farmers will be able to obtain perhaps only half as much machinery and implements during the next four years as they are getting now if the proposals for aid to the 16 Marshall Plan countries are carried out:

As presently outlined, the Marshall Plan would call for shipment of $1 billion, 188 million worth of farm machinery to the 16 nations alone during the next four years. This is more than one-quarter of the estimated total production of the implement industry for the same period.

Whereas the 1947 exports of farm machinery to the entire world will total about $301 million, 600 thousand, of which $67 million will go to Europe, the 1948 exports to the 16 Marshall Plan countries alone would total $370 million, about 23% over present total exports.

With a hoped-for peak production of $1 billion a year, the farm implement industry would have to ship one-third of its output to Europe for two years, and one-fourth for two more. The available two-thirds of the production pie left in 1948 and 1949 would have to be divided between the U.S. and what other nations remain outside of the Plan. The American farmer would get the lion's share of the divvy, but it would still be little better than half of what he is getting now.

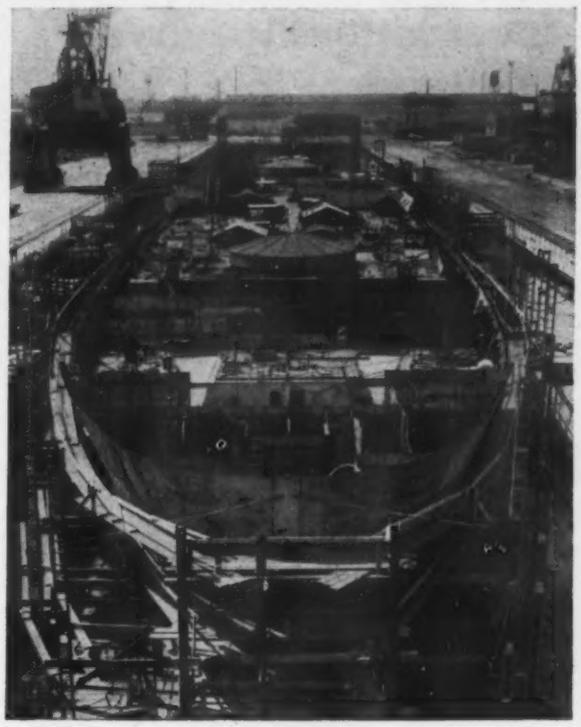
Material Handling Show In Cleveland Jan. 12-16

NEW YORK—One hundred and fifty-four exhibitors have contracted for booth space at the National Materials Handling Exposition in the Public Auditorium, Cleveland, Jan. 12-16.

A Conference on Materials Handling will run concurrently with the exposition and films will be shown on handling subjects. The show will occupy almost 200,000 square feet of exhibit space.

Edwin J. Heimer, president of Barrett-Cravens Co., Chicago, is chairman of the committee. Clapp & Poliak, Inc., 350 Fifth Ave., New York City, will manage the show and all information regarding the show, program conference and accommodations may be obtained throuhg this office.

Virtually all booths will be larger in area than last year. To accommodate the larger booths, the exposition has been moved to the Lakeside exposition halls of the auditorium.



Navy Rocket Ship, the U.S.S. Kentucky, is under construction at the Portsmouth, Va., Navy Yard. Now about 70% completed, this missile ship was originally designed as a battleship of the 45,000 ton Iowa class, but will be finished as a new-type craft for firing rockets

Plane Engine, Propeller Concerns Fight Services on Specifications

WASHINGTON — Aircraft engine and propeller manufacturers are asking the armed forces for the right to use parts of their own design, so long as performance of the finished product meets requiremnts.

Meeting with the services at Wright Field recently the industry argued against government specifications totaling 5,100 pages for each engine contract, compared with 1,200 pages in 1937 and 100 pages in 1927.

Theoretically, conformity with specifications is optional. Actually any deviation, when a spec is available, must be elaborately justified with supporting evidence of suitability.

The industry claims specs are unnecessary, confusing and costly.

That the specs leave producers with insufficient control over the quality of their own product, for which they are responsible so long as it is in use.

That parts made on the same specification by other manufacturers may vary and still be used as maintenance replacements, to the detriment of performance and the reputation of the original manufacturers.

That they have the know-how to design many parts better than the service spec writers can design them.

That it is incorrect in principle for the services to prescribe the minutiae of materials, processes and parts, and then pass responsibilty to the manufacturers.

New Pricing System

LOUISVILLE, KY.—A new pricing method for aluminum extruded shapes, based on the cost of production, will reduce the price of items weighing ¼ lb. per foot and up as much as 4 or 5 cents a pound, the Reynolds Metals Company has announced.

The system, a complete departure from the "factor" pricing method, does not penalize the more simply-designed shapes, and, "individualizes" each price quotation.

Pratt & Whitney Workers Certify Their Machines

WEST HARTFORD, CONN.—Workers at Pratt & Whitney, Division of Niles-Bement-Pond Co., prompted by pride in their machines at the recent Machine Tool Show in Chicago, initiated a collection among the employees to have bouquets of flowers placed on their respective machines.

Similar to placards placed on each machine was one: "This precision machine tool is certified by us to be the best in every detail, visible or hidden, that honest, conscientious craftsmanship can produce" and was signed by "Pratt & Whitney Department 34, the men who assembled it."

Metal Trades Committee Approves Seven Resolutions, Closes Session

STOCKHOLM—The Metal Trades Committee of the ILO wound up its second session with the adoption of seven resolutions. The Committee had for consideration three reports prepared by the International Labor Office on the stabilization of production and employment at high level, mininum income security and labor-management cooperation.

The seven resolutions approved were:

1. A request that governments set up bodies within each country to study the coordination of production, modernization of plants, supply of raw materials, correlation of production and consumption, maintenance of effective demand, standardization of parts and financial and credit policies.

2. A draft inviting the Governing Body of the ILO to seek action on forecasts of the long-term needs of the metal trades for metals which would enable the extracting industries to plan production better than at present.

3. The ILO was requested to prepare a report on fair distribution of raw materials and national specialization.

4. Aid to war-devastated and under-developed countries.

5. More searching investigation of the effects of technological improvements on employment.

6. Appeal to governments, employers and workers organizations to work for the best use of manpower.

7. Realistic studies of minimum income security and the desirability of allowing guaranteed wage plans to emerge through the workings of collective bargaining. The resolution pointed out, however, that a guaranteed wage plan would be self-defeating if it hedged in too closely the employer's ability to adjust.

As the whole question of industrial relations is to be discussed at the International Labor Conference of 1948 in San Francisco, the Metal Trades Committee refrained from passing any formal resolution on labor-management cooperation. Instead it adopted a memorandum with suggestions as to the presentation of the subject at the conference, and recommended that the Office undertake the fullest possible studies.

The crucial need for coal was stressed by several members of a subcommittee. The Swiss workers' delegates urged that the needs of the metal trades for all types of raw materials should be recognized and suggested recommending an international organization to allocate materials on a priority basis. Action of individual governments on this subject was approved due to the unfavorable reaction to setting up another international unit.

Traveling Machine Shop has been provided by Swiss Help as a gift of the Swiss people to repair tractors, agricultural machines, trucks, etc., devastated and now lying idle in northern France. Built on a Ford-Canada 8-ton trailer and equipped with a double grinder, grinding machine, hydraulic 50-ton press, lathe, and drilling machine as well as a worktable and cupboards, the shops can be connected to any local electric power line through their built-in transformer. Each shop costs about $20,000, exclusive of the trailer and tractor, used to haul machinery to the shop which is staffed by two mechanical engineers

Surprise Coming

WASHINGTON—Employers and unions who in the past have leaned on government-paid arbitration have a surprise coming from Cyrus S. Ching, new Federal Conciliation director. He is against this practice.

E. G. Bailey New ASME President

NEW YORK—E. G. Bailey, vice president of the Babcock & Wilcox Co., New York, has been elected president of the American Society of Mechanical Engineers in the national letter ballot. Four regional vice presidents and three directors-at-large were also named. All will assume office at the end of the 1947 annual meeting Dec. 1-5 at Atlantic City.

Other officers elected are:

Regional vice presidents—Frank M. Gunby, Charles T. Main, Inc., Boston; Paul B. Eaton, Lafayette College, Easton, Pa.; Thomas E. Purcell, Duquesen Light Co., Pittsburgh; J. Calvin Brown, Los Angeles.

Directors-at-large—J. B. Armitage, Kearney & Trecker Corp., Milwaukee; Abbott L. Penniman, Consolidated Gas, Eelectric Light & Power Co., Baltimore; William M. Sheehan, General Steel Castings Corp., Eddystone, Pa.

Labor Shortage Causes Large Tractor Demand

CHICAGO—The labor shortage on farms is responsible for a two-way trend in tractor demand. Demand for small tractors is high for small acreage farms and for larger farms as an auxiliary machine.

At the same time manufacturers note a marked increase in the sale of extra large tractors in the corn belt to replace men who are leaving the farms.

On the average, prices of farm implements have increased about 30% since 1940, despite rises in the costs of labor and materials. Other items the farmer buys, as well as his selling prices, have increased much more—so farm machines are a comparatively good buy today with the exception of used equipment. In this field a flourishing "gray market" is noted.

Used tractors and other farm equipment in this grey market are selling at the price of new equipment and in many cases above this level. The only hope for eliminating this condition is increased production, the trade reports. Resale of new equipment is frowned upon by manufacturers but they are powerless to such practices.

Detroit

NEW MACHINE TOOLS IMPRESS AUTO MEN . . . FEED MECHANISMS LAUDED . . . STEEL SHORTAGE FOUGHT

Detroit was impressed by the Machine Tool Show at Chicago. More important, automotive executives who visited there came away with ideas in their minds for buying—ideas which did not exist before their journeys.

This conclusion can be drawn from remarks made by top production men and executives who were among the visitors. AMERICAN MACHINIST obtained some of these viewpoints, and presents them below—a series of impressions from men whose viewpoints are highly important in making decisions on plant equipment:

H. T. Johnson, director, Process Development Section of General Motors Corp.: "While there were not as many completely redesigned machines as I had expected to see, there were many improvements over previous models. The most important of these improvements were:

Better Finishes Seen

"1. The increase in weight and greater rigidity, which should result in greater accuracy and better finishes.

"2. The use of greater power and increased feeds and speeds, which will make possible higher rates of production.

"3 The more convenient location of electrical and hydraulic equipment, which will make maintenance more efficient and safer, and in many cases will result in the machines maintaining their accuracy.

"4. The greatly increased use of electronics, which will eliminate many of the difficulties encountered with other types of controls."

H. L. Weckler, vice-president and general manager, Chrysler Corp.: "It was a very great show, very much worthwhile. I found many new things had been developed since the last show, and we observed all the new developments with a great deal of interest. Any show creating as much interest as this one did is sure to influence future buying."

Progress Surprising

Howard E. Blood, preesident and general manager, Norge and Detroit Gear Divisions of Borg-Warner Corp.: "The machine tool industry has made surprising progress since the war, and recent developments in the industry are making it tough for manufacturers to resist buying and installing more machinery than they had planned. Particular progress has been made in the development of machines with high cutting speeds and increased accuracy. The machines displayed bring us a step closer to the 'pushbutton' factory."

Atom-Smashing Rival of the massive Cyclotron is this electron accelerator which was constructed at Stanford Univ. under a contract with Office of Naval Research. A three-foot section of the unit, according to Dr. William W. Hansen, director of the laboratory, has produced electrons of more than 1½ million volts. William Kennedy is shown at center while Richard Post (back to the camera) operates the controls

W. J. Scott, assistant general manufacturing manager of Chevrolet: "The tool industry has not been standing still. On display were some very new, interesting and advanced ideas which will assist materially in speeding manufacturing operations."

Cary J. Snyder, staff master mechanic, Chrysler; "More advancement was shown at this show than at any previous one. What impressed me most were the facilities for controlling accurate work with unskilled operators."

R. L. Wilhite, production engineering department, General Motors: "The trend toward heavier and more rigid machines is an advance. Improved feeding mechanisms show a move in the right direction.

"Convenience of the tools and operator control efficiency are being given more thought, as is lubrication. Mechanical feeds with electrical control, in some cases, are overcoming the flexibility advantage of the hydraulic feeds, and that's stimulating for manufacturers on both sides. Installations of electrical equipment show outstanding improvements which will reflect in reduction of maintenance problems. It also seems that more consideration is being given to accessibility of the units or components of the machines."

Steel continues very much in the forefront of automobile planning. Most notable of recent developments was the decision of Ford Motor Co. to spend $18-million in an expansion program built mainly around a new blast furnace, which will nearly double present hot metal capacity at the Rouge, and added rolling mill facilities.

Skin Pass Mill Slated

These latter facilities, bought second-hand from Granite City Steel Corp., will be converted to an 84-in. skin pass mill, balancing out present cold mill operations. The main result will be enough added iron production to ultimately remove the company entirely as a scrap purchasing factor. Finished steel capacity will be increased only slightly.

Great Lakes Steel Corp., meanwhile, is also taking steps to be less dependent on scrap. The mill is installing new facilities at Ecorse which will provide additional hot metal. This large producer also is in the completion stages of a cold rolled sheet expansion which is the major factor in the program of National Steel Corp., its parent company, to advance capacity from 700,000 to 1,200,000 tons annually. Added open hearth facilities are involved.

The second annual meeting of the American Society of Body Engineers begins Nov. 5 at Detroit. Sessions will be held on auto styling, production engineering, small cars, seating comfort, truck bodies, buses and coaches, body materials, and body engineering. About 40 supplier companies are exhibiting products.

Survey of 91 Unionized Concerns Shows Split Stand on Conditions

JOSEPH GAMBATESE, WASHINGTON BUREAU

WASHINGTON — Labor and management relations have been closely scrutinized under the congressional microscope for the past two years. But the job is not considered finished. Further changes in labor law are contemplated.

In 1946, Congress passed the Case bill, successfully vetoed by President Truman. This year Congress, overriding a presidential veto, put on the books the Taft-Hartley Labor law.

Primary responsibility for additional legislation is placed by the Taft-Hartley law in the hands of a Joint Committee on Labor-Management Relations. This committee of seven senators and seven members of the House is headed by Sen. Joseph H. Ball (R., Minn.). Its vice-chairman is Rep. Fred A. Hartley, Jr. (R., N. J.), co-author of the new law and chairman of the House Labor Committee. The joint committee's investigations, studies and hearings will result in a preliminary report and recommendations to Congress next March 15. A final report is due Jan. 2, 1949.

At the same time, other congressional committees have set out to expose or correct undesirable labor conditions. These include the House Committee on Un-American Activities, which is after Communists in the labor movement, and various subcommittes of the House Labor Committee.

The Kearns subcommittee jumped into the Hollywood jurisdictional dispute and wants to do something about Petrillo.

The Gwinn subcommittee is probing into restrictive practices in the building trades.

Union interference with the transportation of food is getting the attention of the Smith subcommittee.

To sample conditions in particular plants, McGraw-Hill field editors conducted, during July and August, a mail interview of employers in many types of industries in all sections of the country.

The interview was limited to employers having bargaining relations with a union. Ninety-one returned questionnaires which could be used. They were classified into the following groups: Metalworking, 44; construction, 14; automotive and parts, 12; steel, 5; petroleum refining, 3; aircraft, box manufacturing, food, 2 each; textile, bus transportation, furniture, printing, rubber, paints and varnishes, pharmaceuticals, 1 each.

In 39 cases the employers deal with C.I.O., in 38 with A.F.L. and in 26 with independent unions. This totals more than 91 because some employers reported relations with more than one type of union.

Here's what the questionnaires revealed:

One-third charged unions with limiting production.

One-fourth felt the union requires more workers on a job than are necessary.

Of those who employ apprentices, almost half said the union controls the number which can be employed in proportion to journeymen.

Only one-fifth accused the unions of resisting introduction of labor-saving devices or other technological improvements.

As to productivity, more than half of the 83 employers who expressed an opinion said it was dropping. About one-third said it was rising and one-fifth considered it about the same as pre-war. Twenty-eight blamed the drop on the workers, two on materials, and three on both. One attributed it to the workers and reconversion problems.

In eight instances, management took credit for a rise in productivity. Seven gave credit to the workers, and four to both management and workers. Three attributed a rise solely to technological improvements, and a like number attributed it to a combination of that and worker effort.

Some did not, or could not, fix blame or credit on this issue.

Of 45 incentive wage plans reported, the union limited earnings in one-fourth of them.

Three-fifths of the employers were not satisfied with the effort put forth by their employees.

As to the state of union relations in the plant, 60, or two-thirds, of the employers considered it satisfactory. The others felt this way: unsatisfactory, 9; improving, 20; deteriorating, 2.

While 28 employers charge either the workers or unions limit production, 63 have no complaint.

Tabulation of Replies to Labor Survey Questions

The number of C.I.O., A.F.L. and independent unions involved usually total more than the number of replies because employers gave one answer which, in many cases, covers more than one union.

	YES	CIO	AFL	IND.	NO	CIO	AFL	IND.	STEEL YES	STEEL NO	AUTO & PARTS YES	AUTO & PARTS NO	METAL WORKING YES	METAL WORKING NO
Does union put a limitation on production?	28	12	16	8	63	27	23	17	1	4	3	9	12	32
Does union require more workers than you feel are necessary on a job?	24	9	13	4	67	30	25	22	0	5	3	9	7	37
Does union control ratio of apprentices to journeymen?	30	6	20	8	37	17	10	16	0	3	2	6	13	23
Does union resist introduction of labor-saving devices or other technological improvements?	18	7	13	4	73	32	25	22	1	4	1	11	7	37
Does union limit incentive earnings?	11	6	5	6	34	22	7	10	1	4	2	5	6	20
Are you satisfied with effort put forth by your employees?	36	18	14	13	55	21	24	13	3	2	5	7	18	26

How is productivity in your plant compared with pre-war? Rising, 27 (13 CIO, 6 AFL, 11 Ind.); same, 15 (8 CIO, 6 AFL, 4 Ind.); dropping, 41 (12 CIO, 25 AFL, 9 Ind.).

Union relations in your plant are: Satisfactory, 60 (23 CIO, 27 AFL, 21 Ind.); unsatisfactory, 9 (3 CIO, 5 AFL, 1 Ind.); Improving, 20 (12 CIO, 6 AFL, 3 Ind.); deteriorating, 2 (1 CIO, 1 Ind.).

From the answers of the 28, it appears that what production limitation occurs is strictly by indirect action. In no case does the union put it in writing or even admit that it exists. But the employers say they know it is there.

Most of them blame it on pressure by union leaders on the workers, although one employer, an electrical manufacturer in Cleveland, reports a reverse situation. The union does not limit production, he says, but "workmen do their own policing and do limit production despite appeals of shop stewards and union leaders."

Some companies have found ways of preventing production restrictions. An automobile manufacturer corrected instances of work restrictions "by discipline as they occur." The contract of an automobile parts manufacturer permits discharge of workers for substandard production, the company having won an arbitration award on this point.

A machinery manufacturer had this experience: Confronted with a wage increase demand, it advised the union it could not grant one until production increased. During a trial period of four months, the workers pushed production up 20%. The wage increase was granted. The higher production has been maintained.

Here are some employer descriptions of production limitations:

Electrical Equipment Manufacturer: "Limitation not official, but imposed by individual workers after conference among themselves."

Textile Bag Manufacturer: "Not contractually, but by urging members not to strain themselves."

Manufacturer of Iron Castings: "Certain production lines regularly produce the same number of castings regardless of operating difficulties or breakdowns. This figure, which is identical each day, runs from 10% to 20% below pre-war production."

Electrical Equipment Manufacturer: "There is no formal limit on production but it does go up and down at the bid of the union leader."

Farm Equipment Manufacturer: "By coercion and intimidation to control incentive earnings of employees in attempts to justify high incentive rates or to increase incentive rates."

Producer of Aluminum Castings: "Unable to prove union limits employees' production but an energetic employee soon loses his membership card in the union for some minor infraction of union rules."

Manufacturer of Electrical Controls: "We have a premium incentive system with all standard rates guaranteed. Union, though not openly, discourages operators from earning above a certain ratio even though they could easily do so."

Automobile Manufacturer: "Production workers refuse to exceed daily output standards when attained prior to end of shift."

Construction Contractor: Accuses lathers and glaziers of limiting production. Suspects others, but has no proof.

Construction Engineer: "There is no official limitation by any union, but some trades in some localities seem to keep production down by tacit agreement."

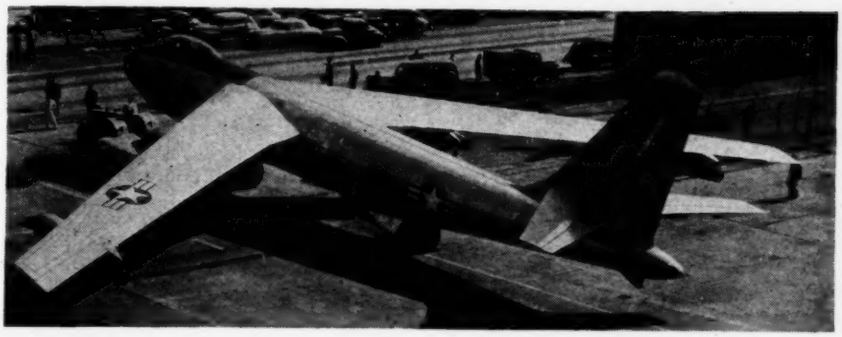
Building Contractor: "Cement finisher does 800 feet a day on hourly rate, but does 1,500 feet a day when paid by the foot."

Manufacturer of Oil Field Equipment: "Employees are reluctant to exceed customary rate of production. In several instances it has been observed that new but experienced operators exceed customary production rate on first or second day of employment, but immediately revert to the customary rate. It is our opinion that in such instances the new employee is persuaded, by the concerted efforts of other employees, to reduce his rate of production to the customary level."

The union in the plant of an automatic screw machine manufacturer refuses to let the workers earn any daily bonus which exceeds four hours' extra pay. In other words, the worker cannot exceed the normal standard by more than 50%.

The union in a polishing and plating plant imposes a production ceiling of 152% of standard for each worker, although management feels that the worker can easily produce from 185% to 200% of standard.

In these last two cases, it is apparent that the standards are too low, or too loose. Management is partly at fault for this situation. Many standards were loosely set during the war in order to increase worker earnings and attract scarce labor. Now these employers are stuck with them.



New Jet Bomber is driven by six General Electric jet engines. The Stratojet has ultra-thin, swept-back wing and tail surfaces. It was produced by Boeing and carries the experimental designation XB-47

Controlled Fragmentation Unveiled

ABERDEEN PROVING GROUND—Control of the direction of fragments from exploding warheads is now possible, it was revealed at a demonstration here attended by more than 3000 members of the Army Ordnance Association. No details of the development were given and its applications were left to the imagination, but a graphic demonstration was made.

Seven targets were mounted on posts and a token warhead was detonated behind an armorplate shield. The detonation produced major fragments weighing approximately 138 grains each and traveling at 2000 fps. One fragment, and only one, pierced each bull's-eye at its approximate center. It was stated that it is possible to control approximately 90% of the metal in an exploding warhead.

Moving with clocklike precision throughout the day, the demonstrations impressed AOA members with the efficiency and scope of the research now being conducted. Demonstrations were given of rain, mud, and dust tests for small arms and winterization work.

At the 29th annual meeting in New York the previous day, it was proposed that the name of the organization be changed to American Ordnance Assn. to indicate the broadening of activities to include Naval and Air ordnance.

Donald Armstrong made a plea for standardization of equipment between the services and Thomas Hargrave, pres. Eastman Kodak Co., and chairman of the Munitions Board outlined the operations of this board under the new National Security organization.

Awards presented at the annual dinner were the Williams medal to James Forrestal, the Crozier medal to Henry L. Stimson, the Crowell medal to Edward B. Gallaher, Clover Mfg. Co., the Scott medal to Reginald E. Gillmor, Sperry Corp., and the Rice medal to Charles K. Davis, Remington Arms Co.

Less Strife Under New Labor Law Predicted at Management Hearing

NEW YORK—Less labor strife if management goes slowly in assuming its new powers under the Taft-Hartley Labor law was predicted at a two-day Personnel Conference of the American Management Association at the Hotel Pennsylvania.

Dr. Leo Wolman, National Bureau of Economic Research, opened the sessions by pointing out that the reason for the change in labor law was brought about by over-organization, zealousness and centralization of powers in the hands of unions. He predicted less strikes since the new law puts more risk in front of labor and union leaders will become more careful. Dr. Wolman presented graphically the manner in which price levels have gradually moved closer to wage scales and warned that this condition cannot continue for long.

Paul M. Herzog, chairman of the National Labor Relations Board, urged management to continue to bargain in good faith to discourage a few "short-sighted" employers who regard the new law as a weapon to weaken labor.

Following Mr. Herzog on the program, John L. McCaffrey, president of International Harvester Co., warned management against retaliation now that the "one-sided Wagner act" has been replaced by a law which gives management the right to bring charges against unions.

At a session on How Labor and Management Are Meeting the Taft-Hartley Law, Lee Pressman, general counsel of the CIO, attacked the law and claimed that industrial discord may be produced as labor fights back against charges which may be brought by unions.

At this discussion George B. Christensen, Winston, Strawn & Shaw, Chicago, discussed A Management Counsel Estimate and M. S. Pitzele, labor editor of BUSINESS WEEK, traced the steps of government in labor relations in a talk on The New Labor Law—Its Place in the Perspective of Labor Relations.

John S. Bugas, vice president and director of industrial relations, Ford Motor Co., spoke after the opening night dinner, attended by more than 1,000.

Mr. Bugas stressed the necessity of management to exercise leadership with respect to men and women who make up the organization.

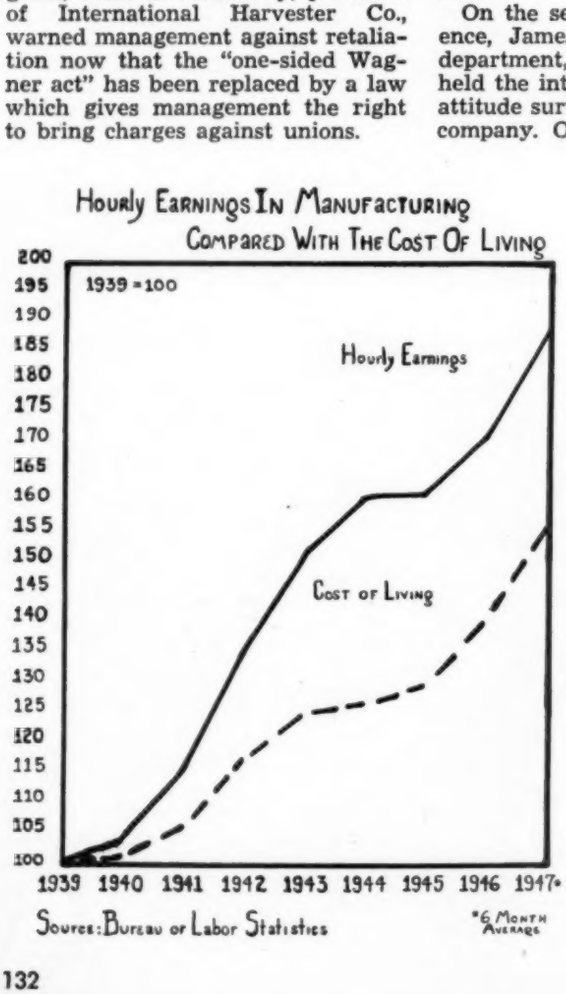
"We believe labor organizations and labor leadership should be a much more valuable aid than they are. But we do not believe that labor leadership can do the whole job," he said.

On the second day of the conference, James C. Worthy, personnel department, Sears, Roebuck & Co., held the interest of all in discussing attitude surveys as conducted by his company. Obtaining the complaints of the employee and acting immediately upon them had done much to gain an effective organization, he said.

Other speakers were:

C. F. Hawker, assistant director of industrial and public relations, U. S. Rubber Co.; Harry Long, plant superintendent, Minneapolis-Honeywell Regulator Co.; Joel Dean, professor of business economics, Columbia Univ.; R. Conrad Cooper, assistant vice president, U. S. Steel Corp. of Delaware; Joe Sweeten, supervisor of industrial relations research, Socony Vacuum Oil Co.; Clark King, vice president of Allegheny Ludlum Steel Corp.; Lawrence Rogin, education director, Textile Workers Union of America.

More than 2,000 representatives of 1,000 concerns attended the sessions.



Hourly earnings from 1939 until 1945 managed to mount faster than the cost of living. Since 1945 living costs have kept up with pay increases and in some instances rose faster. It appears from the chart that the national economy is such now that any wage increases is likely to bring a comparative upturn in the cost of living

Board Appoints Advisory Group

WASHINGTON — Twelve manufacturers and users of machine tools have accepted invitations to become members of the Machine Tool Industry Advisory Task Committee of the Army-Navy Munitions Board.

The committee, which will assist in formulating industrial mobilization plans for the industry, includes:

John A. Bradner, president of Lees-Bradner Co.; G. R. Burt, chairman of the board, Pratt & Whitney Div., Niles-Bement-Pond Co.; Eugene C. Clark, Chambersburg (Pa.) Engineering Co.; Henry J. Cupper, General Motors Corp.; C. W. Fuller, General Electric Co.; F. V. Geier, president Cincinnati Milling Machine Co.; H. A. Ingle, president of Consolidated Machine Tool Co.; Lee Hammond, Hammond Machine Builders; H. E. Lasker, Republic Aviation Corp.; William J. Pearson, Bethlehem Steel Co.; J. H. Schreiber, General Engineering & Mfg. Co.; C. J. Stilwell, president of Warner & Swasey Co.

Filing Time Extended On Contract Reports

The Internal Revenue Bureau has granted industry additional time to file annual reports of income from contracts for naval vessels and army and navy aircraft.

The profit limitation provisions of the Vinson Act became applicable to these items with the expiration of the wartime excess profits tax. Contractors may file up to and including March 15, 1948, annual reports of profit for the calendar year 1946 and fiscal years ending up to and including May 31, 1947, at an interest rate of 6% per year on unpaid installments.

Ultra-Conservative Steel Quotas In 1948 Expected; Cuts Possible

PITTSBURGH—While the steel industry drives with all speed to obtain an increase of 2½ million tons in ingot capacity, there are strong indications that steel companies are going to be ultra-conservative in establishing tonnage quotas to their customers in 1948.

This does not necessarily mean that quotas are going to be reduced from those of 1947, although it would not surprise some analysts if they were. This springs from the fact that quotas of 1947 were put too high, and gave steel processors and fabricators too much to expect in the way of steel tonnage with the result that they established their own manufacturing on such a high plane that it could not be maintained.

Oxygen Supply Awaited

It appears that a considerable portion of the 2½ million additional tons of ingot capacity will not be available until after mid-year in 1948 since a prerequisite to attaining much of this increased capacity is the construction of oxygen plants. Contracts for some of these have been let, others are yet to be concluded: in at least one instance, a tonnage oxygen plant will be completed by the end of this year.

The bottleneck in finished steel output is semi-finished steel. If more ingots can be produced, then there will be more steel rolled.

There are, for instance, new facilities for sheet rolling in and coming in, but maximum utilization of these facilities requires larger allocation of steel to such plants. In addition, increased capacity results from furnace additions and rearrangements of facilities.

One large company here will get a 25% increase in its hot strip mill by adding a fourth slab reheating furnace and rearranging the other three.

It is certain that the major part of the 2½ million additional tons of ingots will be allocated to light flat-rolled steel, but maximum effects of this development cannot be expected to be felt before the latter part of 1948.

As a corollary to use of oxygen to expand steel capacity without too much construction work, and enlargements and repairs of blast furnaces to get more pig iron, there must be plans to increase supplies of raw materials.

Scrap Bottleneck

Scrap is a material bottleneck of the first magnitude; if scrap supplies do not increase—and in many quarters it is felt they won't—then more pig iron must be utilized. This explains a further trend toward "duplexing" in which pig iron is blown in Bessemer converters and then refined in open hearth furnaces.

The heavy drain on coal supplies of recent years and indications of further large consumption has brought about something of a scramble for new coal acreage. There are numerous plans for new mines and rearrangements of old ones to provide for fuel for an increased byproduct coke capacity arranged for in the past two years. Coke-oven building will continue exceptionally active in 1948.

Almost without exception, steel company executives are opposed to using present steel production to build new facilities. They feel the quickest method toward a solution is to pour all their steel into the consumptive trade while they, in turn, utilize all short-cuts in making more steel.

Tin Plate Record Seen

Sufficient time has now elapsed in 1947 to give a clear indication that tin plate output will top the previous peak year of 1941 by a small margin and will go on to another new peak in 1948.

There has been keen disappointment among sheet consumers as a result of one major producer's decision to eliminate December quotas. This is the only way, the steel company feels, that it can catch up with its deferred commitments and enter 1948 with something close to a clean slate. Under this plan, all customers will be treated alike in respect to the cut-off in December.

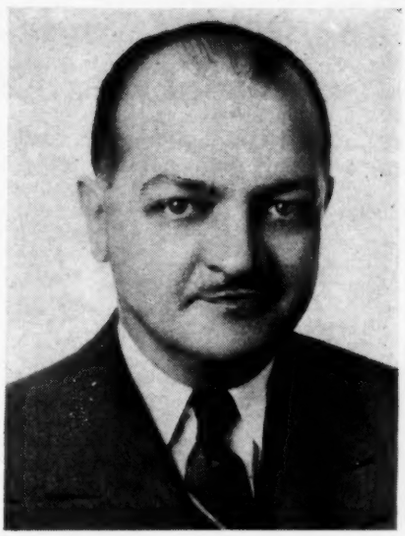
Heavy demands for tanks, freight cars, barges and heavy machinery have combined to keep the plate market one of the tightest in steel, with the exception of light, flat-rolled products.

Many construction projects have been shelved because of high costs, but fabricators are heavily loaded with orders and there is constant pressure on mills for deliveries of shapes.

There is some easing in demand for bars, including some of the smaller sizes.

Demand for wire and wire products and standard pipe items hold at levels in excess of production, and this condition is expected to last for some time to come.

Despite all the reports that fly around in the trade, there is none as yet to give any accurate indication of what will be required of the steel companies in fulfillment of the Marshall Plan.



J. L. Trecker Dies; Ex-Head of NMTBA

MILWAUKEE — Joseph L. Trecker, president Kearney & Trecker Corp., died suddenly of a heart attack on Oct. 7 here. He was one of the best known men in the machine tool industry and through many years had served the National Machine Tool Builders' Association in numerous capacities. He was president of the association in 1944-45.

A graduate of Iowa State College in 1924, Mr. Trecker a year later joined the company which his father, Theodore, and E. J. Kearney had founded in 1898. He became a director in 1928, treasurer in 1934, vice president in 1936 and executive vice president in 1942. Last July he was elevated to the presidency.

Mr. Trecker became consultant to the Secretary of War in 1941 and later was chief of the subcontract branch of OPM. He served too as a member of the WPB machine tool industry advisory committee. He was one of the founders of AMTEA Corp. (American Machine Tool Export Associates) and was its president at the time of his death.

NAMF Elects Board

DETROIT—The National Association of Metal Finishers has elected the following new members to the board of directors:

Albert W. Olson, Industrial Plating Works, Inc., Seattle, Wash.; F. A. Truden, Southern Finishers, Inc., Nashville, Tenn.; John Hilfinger, Hilfinger Corp., Toledo, Ohio; D. J. Griffin, Birmingham Plating Works, Birmingham, Ala.; Charles W. Logan, Logan Platers, Inc., North Tonawanda, N. Y.

Boom in Foundry Equipment Noted

CLEVELAND — Presently operating at 500% over the normal index of 1937-1939, the Foundry Equipment Makers Association received indications at their 29th annual meeting in Hot Springs, Va., that they can expect to operate between 200 and 300% above the index for the next five years.

Otto A. Pfaff, head of the American Wheelabrator & Equipment Corp. and president of the association, also pointed out that the orders on the industry's books now exceed the backlog of the war years.

Arthur J. Tuscany, of the Arthur J. Tuscany Organization, Cleveland, executive secretary of the Association, reported there are ample indications that the market is changing from a seller's to a buyer's market. As competition mounts, he said, there are signs that more engineering is now required on the part of the equipment makers to satisfy the needs of the customers, all of which make for higher sales cost.

Shortage of steel and rising labor costs are presenting problems in the industry, which according to Mr. Pfaff, is more or less committed to holding the price line on its equipment with the realization that customers are offering more resistance to any rise in product and commodity costs.

However, it was pointed out, that rising labor costs mean increased business for the foundry equipment makers.

Foundry equipment makers are interested in the progress being made on a new corporation tax law, now under study, in which consideration will be given to current problems of depreciation and replacement of capital equipment. A provision which would permit more rapid write-off for tax purposes would encourage foundries which have not been mechanized up to present day standards to install modern machinery and equipment.

Organized on a common customer basis rather than a common product basis, the association is firmly behind the work of the Foundry Educational Foundation with members making substantial contributions to the fund which would provide scholarships in a number of technical schools for students interested in entering the foundry industry.

Substantial engineering progress is being made by members of the industry in the field of engineering, material handling and dust collection.

The association was founded in 1919 with 14 members now has 60 members and represents 80% of the foundry equipment industry.

The American Welding Society's board of directors unanimously elected Joseph G. Magrath for the new position of executive secretary. He will direct the activities of the organization with members of the national headquarters staff

Steel Supply Up for Freight Cars

PITTSBURGH—Steel companies intend to maintain their shipments to the freight car industry under the ODT freight car construction program, notwithstanding that the industry contends a sizeable portion of the past months' shipments has failed to go into cars.

The September report of the American Railway Car Institute showed the first attainment of more than 7,000 cars. This was to have developed in June when only 5,500 cars were produced.

This makes 33,000 for the April-September period, during which approximately 1,160,000 tons of steel were delivered by steel mills. On an average of 15¾ tons per average car, this would mean a consumption of 520,000 tons of steel.

It is admitted that some tonnages have gone into extraordinary car and locomotive repairs above the 360,000 tons allocated for such purposes. How much the unaccounted-for 280,000 tons was used for this purpose is not known, but some of it at least is in car builders' inventories for use in making cars in subsequent months. The car builders say they need more than mere steel tonnage to get cars out; the steel items must be in balance with other materials.

The whole is called complete car sets.

Employers Facing Dual Labor Stand

WASHINGTON — Employers of metalworking industries must prepare themselves for two sets of standards in their bargaining relations with unions.

This is one effect of the National Labor Relations Board policy decision which leaves responsibility for complying with the financial registration and non-Communist provisions of the Taft-Hartley law up to the individual national unions and their local affiliates. In a 4 to 1 edict, NLRB rejected the view of Gen. Counsel Robert N. Denham that no AFL or CIO union could qualify for NLRB assistance unless top officers of both filed non-Communist affidavits and these parent organizations also registered with the Labor Dept.

Denham has agreed to go along with the board's interpretation of the law, which means that some unions will use NLRB procedures while others will shun them.

In the metalworking industry, it creates this situation:

The 14 unions affiliated with the AFL Metal Trades Dept. will use the machinery of the NLRB for elections, union shop polls and unfair labor practice charges, etc., just as the International Assn. of Machinists, Independent, has been doing. Employers dealing with these unions may be hailed before NLRB to conduct representation elections, as well as file charges of unfair labor practices.

On the other hand, the CIO unions in metalworking are likely, for awhile at least, to boycott NLRB because of the risk that some of their officers might run if they made false affidavits regarding non-Communist sympathies. Employers faced with these unions may not use NLRB election machinery to determine the majority status of the union, nor may the union rely on NLRB help. Without NLRB, an unqualified union cannot bargain for, nor may the employer grant, a contract containing any provision for compulsory membership.

The situation raises all sorts of problems. CIO Electrical, Steel, Automobile, Farm Equipment and Smelter Workers, for instance, may resort to strikes to obtain recognition. They will also try to induce employers to agree to bargaining elections conducted by impartial methods outside the NLRB. Employers cannot be accused by non-qualified unions of unfair labor practices. They may discharge strikers and union organizers.

Failure of these CIO unions to qualify under the law will also expose them to raiding by AFL and other unions.

Wichita City Libra

Names in the News

Clarence Snyder

Howard N. Maynard

Clarence Snyder, who has been in the machine tool business more than 50 years, has been named chairman of the board of the Snyder Tool & Engineering Co., Detroit. **Howard N. Maynard,** vice president, treasurer and director of the firm, has been elected president succeeding Mr. Snyder, as well as treasurer, while **Kenneth B. Hollidge** has become vice president, secretary and director.

George W. Scott, secretary and treasurer since 1933 of Hotpoint, Inc., has been elected vice president and secretary of the concern. He was replaced as treasurer by **Walter R. Grant.**

Wilson L. Fenn, 2nd, former vice president and sales manager, has been elected president and treasurer of the Fenn Manufacturing Co., Hartford, Conn. At the same time, **John P. Jensen** was named vice president in charge of engineering production; **Emil J. Bilotta** was promoted to vice president in charge of production; and **John A. Rinek** was elevated to the position of sales manager. **Clayton Burt,** chairman of the board of Niles-Bement-Pond Co., was elected a member of the board.

J. A. Herrington, former president of Knu-Vise, Inc., has been elected president of the Lapeer Manufacturing Co.

Arthur G. Chase has been elected president and chairman of the board of the Precision Castings Co., Syracuse, N. Y., succeeding the late **Fred P. Assmann.** Mr. Chase previously was executive vice president and treasurer of the company.

E. W. Meyers, Jr., has been elected president of Trion, Inc., McKees Rocks, Pa., succeeding **Paul W. Aitkenhead.** Mr. Meyers was with Rockwell Manufacturing Co. for 14 years before joining Trion.

Wallace O. Leonard, formerly assistant to the president of Pacific Airmotive Corp., has been elected vice president in charge of the Pacific division.

Charles T. Button has been appointed general sales manager of The Howell Electric Motors Co., Howell, Mich.

Paul J. Moore has been named director of sales and engineering for the Crocker-Wheeler Electric Manufacturing Co., Ampere, N. J.

C. Foster Harry has been appointed vice president in charge of manufacturing for the Universal Winding Co., Providence, R. I.

Raymond A. Carlson has been elected vice president and sales manager of the Toledo Casting Corp., Toledo, Ohio.

C. James Gardner has been appointed Toronto branch manager for the Jessop Steel Co., Washington, Pa. Mr. Gardner, whose headquarters are at 530 Front St. West, was formerly chief of the Machinery, Metals & Chemicals Section, Export Div., Department of Trade & Commerce, Ottawa.

H. P. Hobart, general manager of lubricating sales for the past 17 years, has been elected vice president in charge of lubricating oil sales for the Gulf Oil Corp.

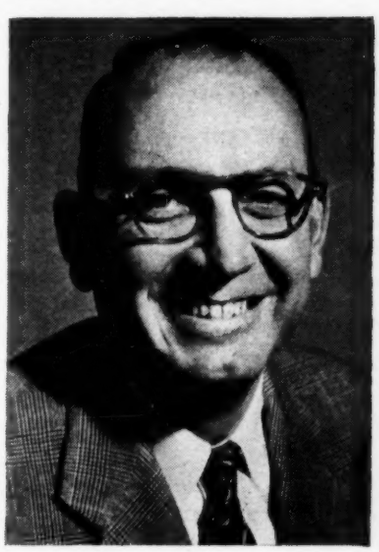
H. C. Edwards, chief engineer of research and development with The Timken Roller Bearing Co., Canton, Ohio, has been appointed director of research and development to succeed **J. F. Leahy** who has retired after 45 years with Timken.

G. Edward Conn, Jr., has been named manager of the newly-established Allis-Chalmers branch office at York, Pa.

R. S. Neblett, manager for the past two years of the Federal and Marine Divisions, General Electric Co., has been named administrator of the company's Nucleonics Project.

Winthrop B. Edwards will become manager of the Yonkers, N. Y., works of the Otis Elevator Co. upon the retirement of **John H. Hornung** on Dec. 1 after 47 years with the company.

John E. Payne, formerly manager of industrial sales, has been named manager of all industry sales departments for the Westinghouse Electric Corp. **R. S. Kersh,** manager of the company's Houston, Texas, office was named to succeed Mr. Payne as manager of industrial sales.



Jack L. Ashby

Jack L. Ashby, general sales manager of the Iron and Steel Div., Kaiser Co., Inc., since its inception five years ago, has been appointed vice president and assistant general manager of the firm. **C. F. Borden,** assistant general sales manager, succeeds Mr. Ashby as general sales manager.

Donald L. Boyce, former manufacturing superintendent of the Saginaw, Mich., Iron plant of General Motors Corp., has been appointed plant manager of the Central Foundry Div., Lockport, N. Y. He succeeds **Alvin B. Thomas,** resigned.

Robert B. Haynes

Robert B. Haynes has been promoted to the newly-created position of works manager of the Spicer Manufacturing Div., Dana Corp., Toledo, Ohio. Mr. Haynes has been with Spicer since 1935, recently serving as equipment manager.

Paul R. Hermann has been appointed manager of the Chicago branch of E. C. Atkins & Co., Indianapolis, Ind.

BUSINESS ITEMS

Alloy Steel Products Co., Linden, N. J., has established a new sales office at 332 So. Michigan Ave., Chicago. **H. E. Johnson,** formerly with Edward Valves, Inc., has been named Chicago district manager.

The Whiton Machine Co., New London, Conn., has appointed two exclusive representatives for its lathe chucks, centering machines and gear cutting machines. **The Strauss & Haas Co.,** New Orleans, La., has been appointed representative in that area, while **Joseph Monahan,** of Grand Rapids, Mich., will serve as the company's representative in western Michigan.

Niagara Wire Products, Inc., has been incorporated in Buffalo, N. Y., by **Edward M. Sheehan, John J. O'Hara** and **Arthur G. Madison.**

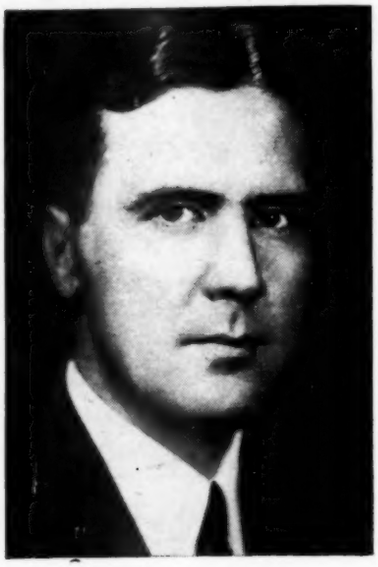
Allied Die & Tool Works has moved to new quarters at 1101 22nd St., Rockford, Ill.

Chicago Steel Treating Co., 333 No. California Ave., Chicago, has been acquired by **Robert B. Seger** and **Andrew L. Olson,** former superintendent and assistant superintendent of the Lindberg Steel Treating Co.

The Market Development Co. has been formed in Wellesley, Mass., by **J. Howard Blake,** former director of market research for The Glenn L. Martin Co. The new firm offers "planned distribution" in New England to manufacturers.

By-Products Steel Corp. and **Lukenweld, Inc.,** wholly-owned subsidiaries of **Lukens Steel Co.,** will cease their corporate existence on Nov. 1. Their identity and operations will be continued as separate divisions of Lukens.

OBITUARIES



W. Gibson Carey, Jr.

W. Gibson Carey, Jr., 51, president of The Yale & Towne Manufacturing Co., Stamford, Conn., for the past 15 years, was accidentally drowned in Florida Oct. 4. In 1929 he was elected to the board of directors of Yale & Towne and later that year became assistant to the president. He advanced to vice president and treasurer and in 1932 was elected president. He served as president of the U.S. Chamber of Commerce in 1939-40, and at the time of his death was chairman of the board of the National Industrial Conference Board.

A. G. Bussman, 61, vice president in charge of sales since 1945 of the Wickwire Spencer Steel Co., died Oct. 8. He was formerly president of the Standard Steel and Wire Co., Greenburg, Pa. Since joining Wickwire Spencer in 1931 he has served successively as manager of the wire and spring department, sales manager of the Buffalo district, assistant to the president and general manager of sales.

Harrison W. Flickinger, vice president of Republic Aviation Corp., Farmingdale, N. Y., since 1941, died Oct. 5. He joined Republic in 1939, following his retirement from the Army where he was a lieutenant colonel, and has since served as European representative as well as in the home office. For the past year he has been the company's Washington representative.

Edmund H. Titchener, 88, founder and president of E. H. Titchener & Co., Binghamton, N. Y., died Sept. 22.

John H. Porter, 74, former secretary of the Inland Steel Co., and past president of the Buffalo Steel Co. and the Calumet Steel Co., died Sept. 29.

Arthur E. Vosler, 62, head of the Vosler Manufacturing Co., Medina, N. Y., passed away Sept. 25.

MEETINGS

American Gear Manufacturers Association. Fall meeting. Edgewater Beach Hotel, Chicago. Oct. 27-29. Newbold C. Goin, executive secretary, Empire Bldg., Pittsburgh 22.

American Society of Body Engineers. Annual convention. Rackham Memorial Building, Detroit, Nov. 5-7. A. H. Haberstump, chairman publicity committee, 100 Farnsworth Ave., Detroit 2.

American Society of Mechanical Engineers. Annual meeting. Atlantic City, N. J. Dec. 1-5. Ernest Hartford. executive assistant secretary, 29 West 39 St., New York.

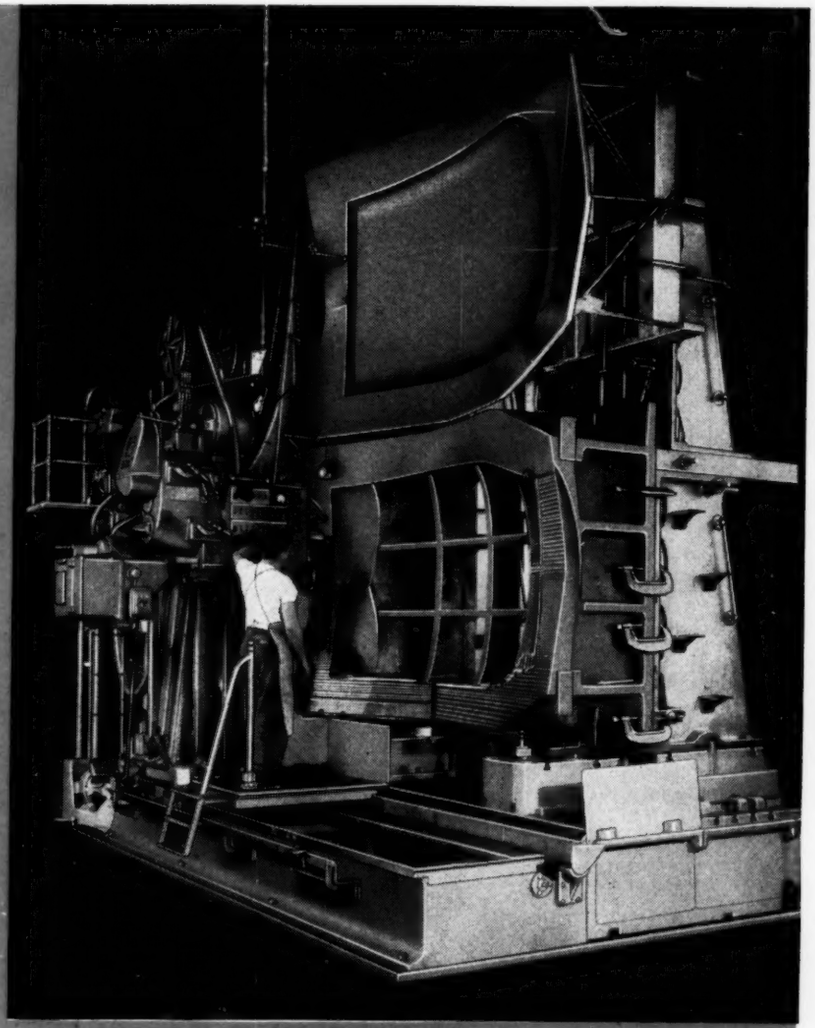
American Society of Tool Engineers. Semi-annual convention. Statler Hotel, Boston, Oct. 30-Nov. 1. J. Cannon, director of public relations, 1666 Penobscot Bldg., Detroit 2.

Industrial Management Society. 11th National Time and Motion Study Clinic. Sheraton Hotel, Chicago. Nov. 5-7. Ralph M. Landes, chairman, 176 West Adams St., Chicago 3.

National Tool and Die Manufacturers Association. Annual meeting. Benjamin Franklin Hotel, Philadelphia, Pa. Nov. 2-5. George Eaton, executive secretary, 1412 Union Commerce Bldg., Cleveland 14.

Society for Experimental Stress Analysis. Annual meeting. Hotel Pennsylvania, New York, Dec. 4-6. W. M. Murray, secretary-treasurer, Central Square Station, Cambridge 39, Mass.

BIG DIES



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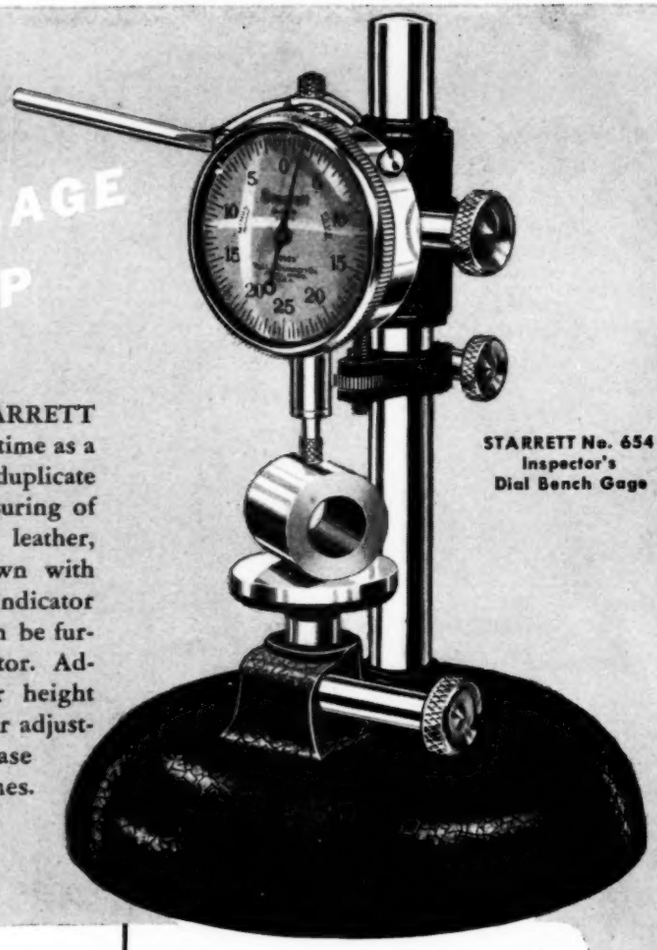

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Simple, reliable, sensitive, easy to read, easy to set up and use — that's what makes STARRETT Dial Test Indicator No. 196 a favorite with toolmakers, machinists and inspectors. Many special attachments provide for universal application to all classes of work. Dial graduated .001", reading 0-100, range .200".

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Electrical Steel—I

COURTESY AMERICAN IRON & STEEL INSTITUTE

FLAT-ROLLED electrical steel comprises the specially manufactured steels containing up to 6% silicon, in cut lengths or in coils, which are processed to develop definite magnetic and physical properties appropriate to the special conditions under which they are used. They are produced in gages and sizes within mill limitations. Tolerances for thickness, width, length, camber or out-of-square are established on the basis of standards necessary in this commodity.

Types of Flat-Rolled Electrical Steel

The following types of flat-rolled electrical steel have been established as standards:

Type M-14 is a low core loss transformer electrical steel used for power and distribution transformer cores, and for highest efficiency rotating machines.

Type M-15 has higher core loss than M-14 and is used for power and distribution transformers, and for rotating machines.

Type M-17 is used occasionally for power and distribution transformer cores, where Type M-19 will not meet the requirement.

Type M-19 is most suitable for large rotating machines, communication transformers and reactors.

Type M-22 is especially suited for stators of induction motors, and other high-efficiency rotating electrical equipment. Used also for intermittent duty, transformers and magnetos.

Type M-27 is suitable for continuous-duty, high efficiency motors, small transformers and other special applications where the M36 Type will not meet the core loss required and where the flux density is moderate.

Type M-36 is used especially for rotating machines, including AC and DC motors where lower core loss is required than for the Type M-43.

Type M-43 is suitable for fractional-horsepower motors, pole pieces and relays.

Type M-50 is used for intermittent operating electrical apparatus and pole pieces. This grade is not subject to any magnetic test requirements.

NOTE 1. Types M-14, M-15, and M-17 are normally used in 29 gage.

The industry has established a Manufacturers' Standard Electrical Sheet Gage Table (ESSG), and no other gage table is applicable to flat-rolled electrical steel. Because the maximum core loss values can be met only for a definite thickness, and since the actual density of the steel varies with type, electrical steel is always manufactured to the decimal thickness shown below, subject to the thickness tolerances given under Standard Practice Tables, and not to gage weight tolerance.

Standard Mill Practice

Standard Permissible Variations for Dimensions and Workmanship. The standard permissible variations shown in the succeeding tables represent the maximum deviations to be expected.

All sheets are not measured at the mill. Sheets found by the purchaser to exceed permissible variations are subject to rejection.

Permissible Variations in Thickness. The variation from the specified electrical sheet gage number or equivalent decimal thickness, for sheets in cut lengths or coils 48 in. wide or less, shall not exceed the

Manufacturers' Standard Electrical Sheet Gage

Electrical Sheet Gage Number	Thickness, In.	Electrical Sheet Gage Number	Thickness, In.
32	0.0100	20	0.0375
30	0.0125	19	0.0435
29	0.0140	18	0.0500
28	0.0155	17	0.0560
27	0.0170	16	0.0625
26	0.0185	15	0.0700
25	0.0220	14	0.0780
24	0.0250	13	0.0940
23	0.0280	12	0.1090
22	0.0310	11	0.1250
21	0.0340		

Permissible Variations in Thickness of Flat Rolled Electrical Sheets

Electrical Sheet Gage Number	Equivalent Thickness In.	Permissible Variation Over or Under, In.
32 to 27, incl.	0.0100 to 0.0170, incl.	0.002
26 to 22, "	0.0185 to 0.0310, "	0.003
21 to 20, "	0.0340 to 0.0375, "	0.004
19 to 18, "	0.0435 to 0.0500, "	0.005
17 to 15, "	0.0560 to 0.0700, "	0.006
14	0.0780	0.007
13	0.0940	0.008

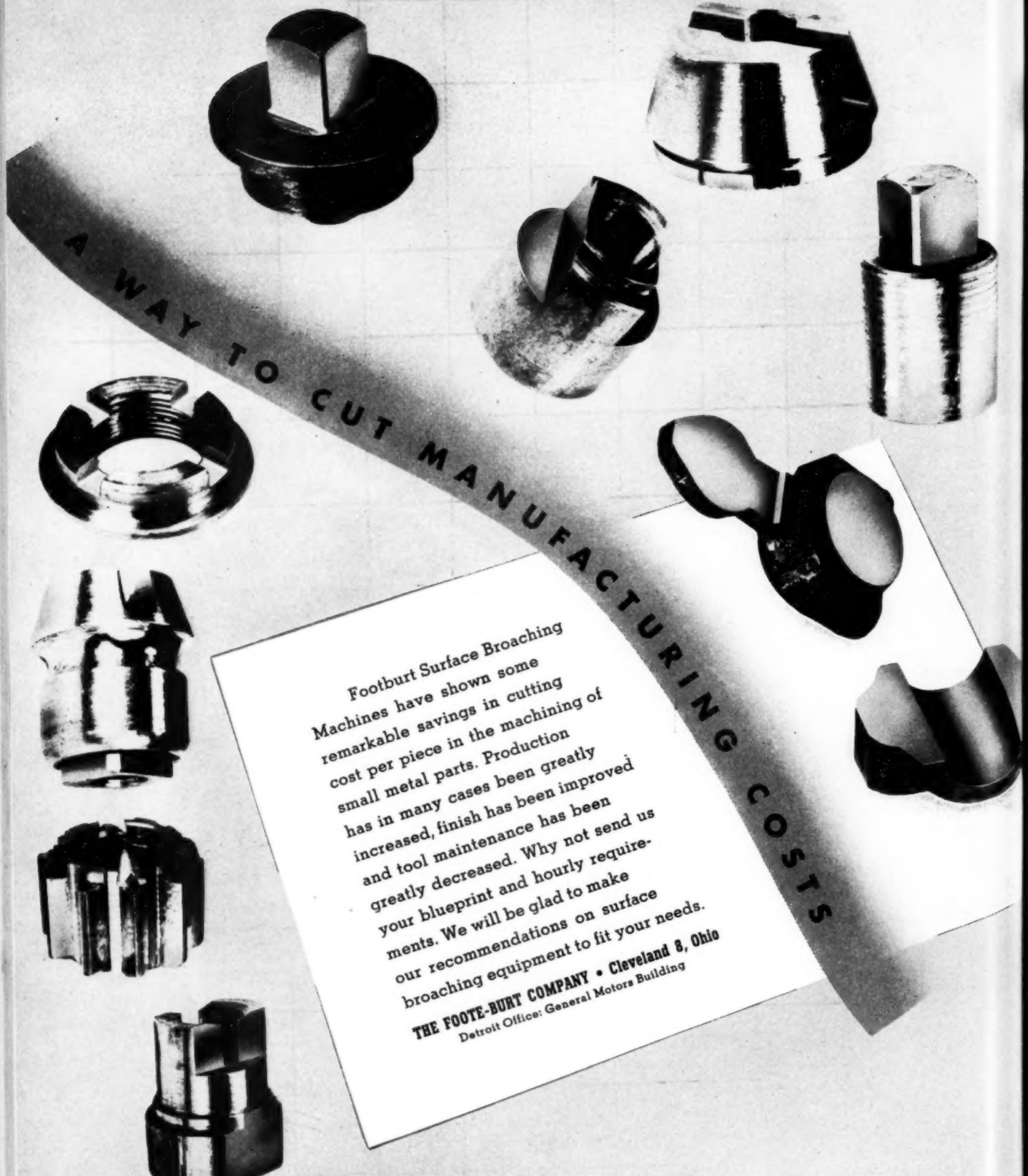
NOTE: Thickness is measured at any point on a sheet not less than ⅜ in. in from an edge.

Permissible Variations in Width of Flat Rolled Electrical Sheets, Not Resquared

Width, Inches	Tolerance, In.	
	Minus	Plus
To 6 incl.	" 1/64	" 1/64
Over 6 to 15 incl.	" 1/32	" 3/32
" 15 to 20 incl.	" 0	" 1/16
" 20 to 30 incl.	" 0	" 1/4
" 30 to 48 incl.	" 0	" 3/8

Permissible Variations in Length of Flat Rolled Electrical Sheets, Not Resquared

Specified Lengths, Inches	Variations From Specified Lengths, In.	
	Minus	Plus
To 15 incl.	0	1/8
Over 15 to 30 incl.	" 0	" 1/4
" 30 to 60 incl.	" 0	" 1/2
" 60 to 96 incl.	" 0	" 3/4
" 96 to 120 incl.	" 0	" 1
" 120 to 156 incl.	" 0	" 1 1/4


A WAY TO CUT MANUFACTURING COSTS
Footburt Surface Broaching Machines have shown some remarkable savings in cutting cost per piece in the machining of small metal parts. Production has in many cases been greatly increased, finish has been improved and tool maintenance has been greatly decreased. Why not send us your blueprint and hourly requirements. We will be glad to make our recommendations on surface broaching equipment to fit your needs.
THE FOOTE-BURT COMPANY • Cleveland 8, Ohio
Detroit Office: General Motors Building

FOOTBURT

Surface Broaching

FOOTBURT PATENTED TOOTH FORM

Electrical Steel—II

limits established in the table, p. 139.

Permissible Variations for Resquared Sheets. When sheets are ordered resquared, the width and length shall not be less than the dimensions specified. The permissible variation for over-width, over-length, camber, and out-of-square shall not exceed 1/16 in. for sheets up to and including 48 in. in width or 120 in. in length; nor ⅛ in. for wider or longer sheets.

Permissible Camber. Camber is the greatest deviation of a side edge from a straight line. The measurement of camber is made on the concave side of the flat-rolled electrical sheet with a straight edge. The permissible camber is ¼ in. in any 8 ft.

Permissible Out-of-square. Out-of-square is the greatest deviation of an end edge from a straight line of right-angles to a side and touching one corner. The standard permissible variation for sheets of all gages and all sizes, not resquared, is 1/16 in. per 6 in., or fraction thereof, of width.

Flatness. Because experience indicates the extreme difficulty in adequately defining the degree of flatness necessary for any application, no specific limits of flatness have been established. It is recognized that sharp, short waves and buckles are objectionable. It should be observed that flat-rolled electrical steel is produced for its magnetic properties, and that the usual flattening operations performed on ordinary low-carbon sheets cannot be performed after the final magnetic anneal, as such operations would impair these properties.

Cut Downs. In the process of the manufacture of flat-rolled electrical steel, there will usually be a small percentage of cut downs. In the shipment of electrical steel, it is the practice to include cut downs in multiples of 12 in. or in multiples of the blank sizes specified by the purchaser.

Coil Weights and Coil Diameters. There are no industry standards for coil weights or coil diameters as these limits depend upon the mill equipment used. When the purchaser's equipment limits the coil weights and coil diameters he can handle, the manufacturer should be so advised.

Short Coils. What is commonly referred to in the industry as a *short coil*, is a coil weighing between 10% and 75% of a manufacturer's standard coil weight or a specified maximum coil weight. Ordinary practice is to ship such coils with not more than four coils nested to make up full-sized coils, unless specified otherwise.

Special Manufacturing Practices

Deoxidized Surface. Deoxidizing of flat-rolled electrical steel is an operation accomplished by the use of a reducing gas, either through or during a portion of the annealing cycle, which substantially lessens, by chemical reduction, the amount of hot mill oxide and minimizes the development of annealing oxide. Deoxidizing is a special manufacturing practice for electrical steel with no magnetic specification.

Pickling. For certain applications, surface oxide must be removed at some stage of the manufacturing operations. This is usually done by pickling. When pickling is to be performed on flat-rolled electrical steel of certain grades and gages it should be so specified, and constitutes a special manufacturing practice.

Oiling. The purpose of oiling flat-rolled electrical steel is to retard rusting in storage or in transit. It is particularly advisable when electrical steel is pickled or deoxidized as final processing. Precautionary measures must be taken against the accumulation of condensed moisture or other moisture on the steel, since oiling is a temporary protection.

Special Test Requirements. Core loss tests are considered as the standard in connection with flat-rolled electrical steel where such losses are specified. Other tests which may be specified, such as permeability, ductility, space factor, electrical resistivity, interlamination resistance tests, tensile, aging, hardness, etc., constitute additional special manufacturing practices.

Restrictive Tolerances. Tolerances for thickness, width, length, camber, out-of-square closer than the standards set forth herein require special manufacturing practices.

Maximum Core Losses of Flat Rolled Electrical Steel

Watts per pound at 60 cycles when tested according to ASTM Standard Methods A-34 of latest issue.

Electrical Sheet Gage No.	29	28	27	26	25	24	23	22
Thickness, Inch	0.0140	0.0155	0.0170	0.0185	0.0220	0.0250	0.0280	0.0310
Type No.	Core Loss (Watts/Lb.) at 15 Kilogausses							
M-14	1.40							
M-15	1.50	1.57	1.65	1.73				
M-17	1.65	1.72	1.80	1.88				
M-19	1.85	1.93	2.02	2.10	2.25	2.40		
M-22	2.15	2.23	2.31	2.40	2.60	2.80		
M-27	2.65	2.75	2.85	2.95	3.20	3.40	3.70	4.10
M-36	3.60	3.67	3.74	3.80	4.10	4.40	4.95	5.50
M-43	4.30	4.37	4.44	4.50	4.80	5.30	5.85	6.50
	Core Loss (Watts/Lb.) at 10 Kilogausses							
M-14	0.52							
M-15	0.58	0.61	0.65	0.68				
M-17	0.65	0.68	0.72	0.75				
M-19	0.72	0.76	0.80	0.83	0.90	0.97		
M-22	0.82	0.86	0.90	0.94	1.02	1.10		
M-27	1.01	1.05	1.09	1.14	1.22	1.30	1.44	1.60
M-36	1.17	1.23	1.29	1.35	1.50	1.70	1.94	2.17
M-43	1.30	1.38	1.46	1.55	1.75	1.98	2.23	2.50

NOTE: Core losses may be specified at either 15 Kilogausses or 10 Kilogausses and 60 cycles, but not at both inductions.

Electrical Steels Not Subject to Core Loss Specification Types 50 to 55

Type M-50. The lowest silicon electrical steel for intermittent operating electrical apparatus.

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WITH ARMCO ELECTROPOLISHING . . .
You can polish many kinds of stainless steel products to a high luster *in one operation* —without turning a buffing wheel!

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If your products are made of plated metals it may pay you to investigate the possibilities of ARMCO Stainless Steels — and the Electropolishing process. Many manufacturers have cut costs and made good products better by changing over to Electropolished stainless steel parts.

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For more information about this cost-saving method of polishing stainless steels, just fill in the handy coupon on this page. We'll send you a fact-filled folder on Armco Electropolishing titled "Polish Stainless Steels This Easy, Low-Cost Way." Mail it today! The American Rolling Mill Company, 333 Curtis St., Middletown, O.

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American Machinist REFERENCE BOOK SHEET

Requirements for Die-Casting Alloys

BY A. W. SUNDWICK, FISHER BODY-TERNSTEDT DIV., GENERAL MOTORS CORPORATION

CURRENT zinc-base die-casting alloys are maintained closely to the composition of best castability, and the limit of variation is within and much more narrow than that allowed in the alloy specification. To avoid defects in castings (*AM*, pages 129-131, Sept. 25, 1947), this high degree of uniformity and close control is most necessary when the die is not correctly designed. But if the die can be put in proper condition, it will be found that a large share of the troubles attributed to the metal will disappear.

Most well-designed dies will produce satisfactory castings on a consistent basis, even though the composition of the alloy may vary to the extremes of the specification limits. But too often, the dies are extremely critical, either because of the shape of the cavity or the arrangement and design of the gates, runners and overflows. In such cases, good castings are produced only when functioning of the die-casting machine is perfect and the metal is held closely to the best composition for castability.

From experience with the Type 5 alloy, the composition for best castability is:

Aluminum	3.9 to 4.3%
Copper	1.0 to 1.25%
Magnesium	0.03 to 0.04%
Lead+cadmium +tin	less than 0.003%
Iron	less than 0.05%

The alloying department can aim for this composition and will, with average control, be able to maintain it for a good share of the time.

When the alloy is of the above composition, the solidification curve discloses that no crystals freeze out above 740 F. The shape of the curve is affected by the aluminum content and to a lesser degree by the contaminating elements in solution. When the contaminating elements are not soluble, they will not affect the solidification curve but will influence the rate at which the molten metal will flow through an orifice. These two properties suggest means for checking the alloy in the shop and are used as a shop control at Fisher Body-Ternstedt.

When the alloy is off-specification, certain casting difficulties and surface defects will arise. Sources of trouble are itemized with respect to major elements outside specification limits:

Aluminum—When the aluminum content drops below 4%, there will be increasing difficulty in casting parts free of chills, cold laps and swirls. This trouble is hardly noticeable when the content of aluminum is slightly below 4%, but becomes sharply evident at a content of 3.5% or less. At 3% content, there will be difficulty with sink-spots in castings having large differences in cross-section. The addition of copper does not ameliorate the trouble.

If the aluminum content is above 4%, brittleness of the cold casting and hot-shortness arise, and castings will break in the dies. Maximum effect is created by a 5% aluminum content.

Aluminum is lost to some extent in remelting. In regular operation, it will be found necessary to add aluminum to the remelt pots. The quantity to be added is difficult to standardize, because the amount lost depends on the degree of iron pick-up and the condition of the remelted scrap.

Copper—This element varies from 0 to 3.5% in standard casting alloys. It contributes to corrosion resistance but makes the alloy less stable, both in dimensions and mechanical properties. Copper promotes better castability by making the alloy less subject to sink-spots. Some copper is usually essential for castings that have appreciable differences in cross-section.

Magnesium—Though magnesium is added to the alloy in small quantities, primarily to protect it against intergranular corrosion caused by lead, tin and cadmium, it also has a pronounced effect on the casting properties. Magnesium makes the alloy somewhat more sluggish. Although this would seem to be a drawback, actually it is beneficial to castability in many ways. Being less fluid, the molten alloy is less likely to spray and splash in the die cavity. By increasing the magnesium content to about 0.04%, "splashes" may be overcome. With high magnesium content, the die surface becomes quickly coated with a heat-insulating film, which reduces the tendency of the casting to chill. Since spraying is reduced by addition of magnesium, it will be found that there will be less trouble with "soldering," provided that the magnesium content is kept within proper limits. As magnesium is increased above 0.05%, there will be a greater tendency for the castings to show cold laps and swirls. Above 0.08% magnesium content, the alloy is hot-short.

Iron—High iron content contributes to practically any of the casting difficulties and surface defects known to the die caster. Special care should always be taken to keep the iron content as low as possible. The aluminum content, if kept within specifications, will do much in this direction, but further reduction in the iron content can only be obtained by blending with an alloy of higher purity.

Lead, Cadmium and Tin—There is some evidence that these metals, when close to the maximum limits allowed by the specification, will cause surface defects on castings made in critical dies. When castings are required to have high surface quality, it will be best to hold these elements to the low limit of the specification.

When lead, cadmium and tin appreciably exceed the maximum quantities allowed in the alloy (0.007% lead, 0.005% cadmium and 0.005% tin—or a maximum total of 0.01%), the metal is hot-short and brittle. Sections will break off in the die and the castings will often fall off the gates.

New Britain Model 365

does the job twice as fast by working from both ends at once

A NEW TOOL ROTATING DOUBLE END CHUCKING MACHINE

Fast Index, Power Chucking, Steady High Production

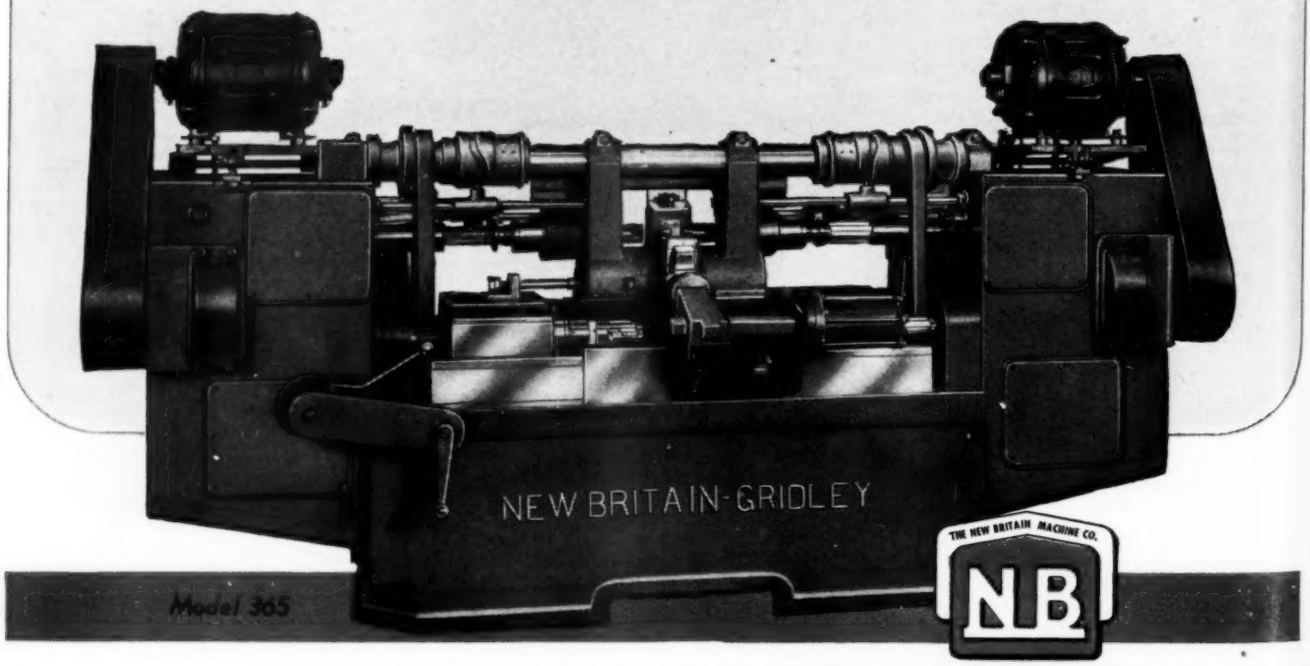
Featuring **1.** A four-chuck horizontal indexing turret with three work spindles on each side. One position for loading. Rough and finish bore, face, drill or ream in the first two positions; finish ream or thread in third position.

2. Over-all weight, power, and rigidity make possible the use of carbide tools and dampen any tendency to vibrate when running at high speed.

3. Anti-friction spindles mounted in positionable quills carried in slides to minimize overhang. Spindle speeds up to 2,000 RPM have been provided for fast machining of non-ferrous metals.

4. Ease of operation. Loading position is waist high. All controls within easy reach of operator. Automatic chucking quickly accomplished. Many types of pieces may be magazine loaded. Until fully inter-locked safety devices are satisfied, turret will not index nor tools jump.

5. High production. Rapid jump and drawback on all feeds. Total idle time of index - 1.67 seconds. Two pieces may be finished at one chucking on some jobs. Geneva motion index and locking mechanism completely enclosed and guarded against dirt and chips. Either lead screw threading or lead cam threading to take full advantage of self-opening dies or collapsing taps available in No. 3 position. Threading spindles may have different speeds and feeds and will reverse within closest limits on each successive cut.



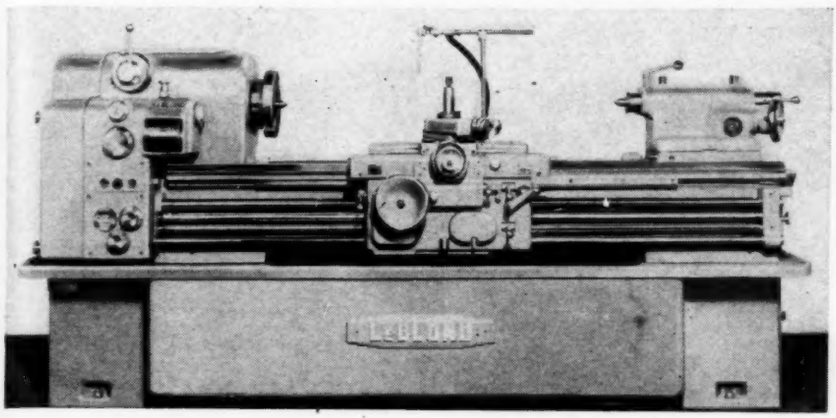
THREE OTHER NEW MACHINES

Latest additions to the New Britain line include: The new, faster more powerful line of automatic screw machines designed to make the most of carbides on long and short runs, a new line of precision cam and air actuated contour turning and boring machines, and a new line of automatic turret lathes.

M-01063

NEW BRITAIN
Automatics
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

Shop Equipment News



Variable-speed drive on this lathe replaces brakes and clutches. It provides controlled acceleration for all starting conditions. The motor can be stopped and started without interfering with speed setting

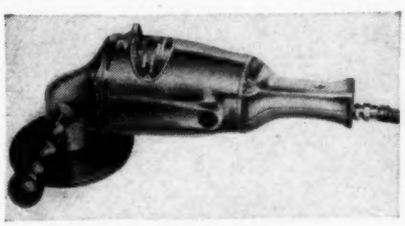
Adjuster Controls over 300 Speeds On LeBlond 16-in. Toolroom Lathe

Wide spindle-speed range and ease of operation are featured on the 16-in. Model RT toolroom lathe introduced by R. K. LeBlond Machine Tool Co., Dept. AM, Cincinnati 8, Ohio. A speed adjuster controls over 300 speeds from 6 to 1500 rpm., and more than 100 speeds can be obtained in each of three ranges provided by the combination gear-belt drive headstock without stopping the spindle rotation.

A universal power traverse moves the carriage, cross-slide and tailstock of the machine. The totally enclosed quick-change gear box has a revolving index plate on the feed box which contains instructions for obtaining five different types of feeds, which provide 60 threads and leads each.

The combined-feed apron has an arrangement for connecting length- and cross-feeds for cutting steep tapers in connection with geared-type taper attachment. The thrust-lock tailstock has worm-and-rack construction and provides full length bearing support to the spindle barrel. An L-shaped bed supports the entire headstock base.

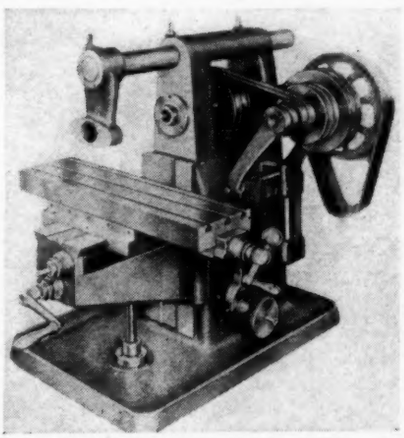
The variable-speed drive consists essentially of four elements: speed-control unit, 7½-hp. adjustable-speed main drive motor, speed adjuster with rheostat, and motor generator. The speed-adjuster unit is within easy reach of working position. It consists of shifter for shifting to any one of the three drives, speed-selector for varying speed of main drive motor, and button for jogging main drive motor.



Disk Sanders and Polishers Added to Metalmaster Line

"Kool Grip" portable disk sanders and polishers have been added to the Metalmaster line of portable electric tools made by Bradford Machine Tool Co., Cincinnati 4, Ohio. The units incorporate a baffled air intake through the rear handle which directs air onto the motor and keeps the handle cool for the operator.

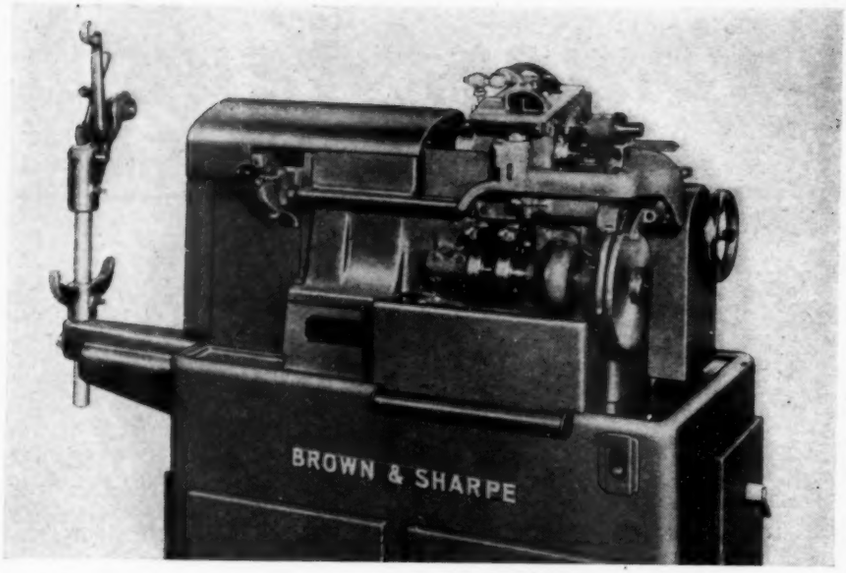
Double-reduction gears are used to decrease centrifugal force and permit a small spindle motor. All ball-bearings in the units are permanently lubricated. A safety slide switch worked with the thumb is incorporated. Three models are made: 7-in. heavy-duty sander, 9-in. standard-duty sander and 7-in. polisher. Standard equipment includes detachable side handle, backing pad, three disks for the sander and lamb's wool bonnet for the polisher.



Diamond Model B-12 Bench Mill Provides Rapid Belt Shifting

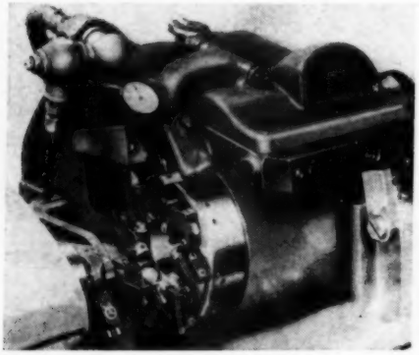
The Model B-12 bench mill has been added to the line of Diamond Machine Tool Co., 3429 E. Olympic Blvd., Los Angeles 23, Calif. Weighing 450 lb., it is the largest bench mill made by the firm. The table has 4⅛x20-in. area, 12-in. longitudinal travel, 9-in. vertical travel, and 6-in. transverse travel. Three T-slots are provided for mounting work.

The spindle is mounted in tapered roller bearings and is equipped with No. 9 B&S taper. Power is transferred to spindle by a three-step pulley with double V-belts, providing drive for heavy cuts. A bracket supporting the jackshaft is arranged for rapid belt shift and tension adjustment. Speed range of spindle is from 100 to 1400 rpm.



Change gears provide 58 rates of production on this automatic machine

Setup Simplicity on Brown & Sharpe Automatic Pinion-Turning Machine

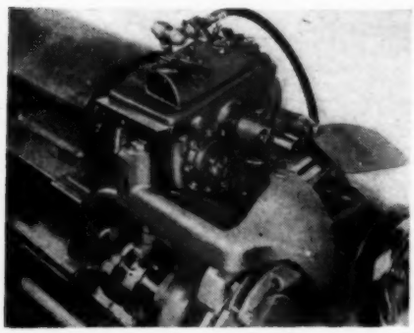


Accurate replacement of tools is afforded by tool-adjusting dial indicator on swing arm. Dial reading of original tool setting is simply duplicated when new tool is inserted

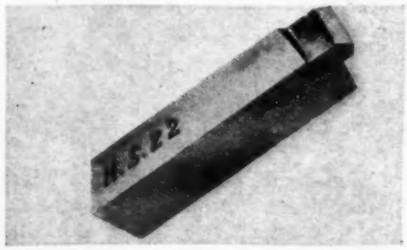
Simplicity of setup duplication is the outstanding feature of an automatic pinion-turning machine announced by Brown & Sharpe Mfg. Co., Providence 1, R. I. Circular-formed single-point tools are used, and the machine incorporates a built-in tool-resetting indicator and centering gage, and individual micrometer stops for each of the eight tool positions.

A constant-speed drive shaft is said to provide uniformly rapid automatic movements, regardless of time required to make a part. Change gears provide rates of production from 3 to 364 sec. per piece per cycle. There are 16 spindle speeds from 910 to 10,000 rpm., and the largest feeding finger accommodates stock to ¼-in. dia. and turns up to 2⅞-in. length. Drive is by a 2-hp. motor mounted inside the base on an adjustable bracket.

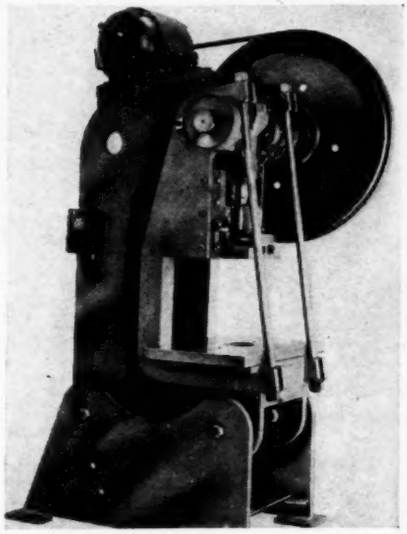
The machine is designed to eliminate many mechanical sources of inaccuracy. It employs only two cams in the drive mechanism, mounting them close together on the same drive shaft to eliminate torque distortion. Ratio of cam-lobe rise to longitudinal feed is as much as four to one.



Individual micrometer stops for the tools are incorporated to speed up original setup and simplify duplication when the tools are replaced



Circular-formed single-point tools used on the machine are said to retain exact original shape after full-length surface grinding on face

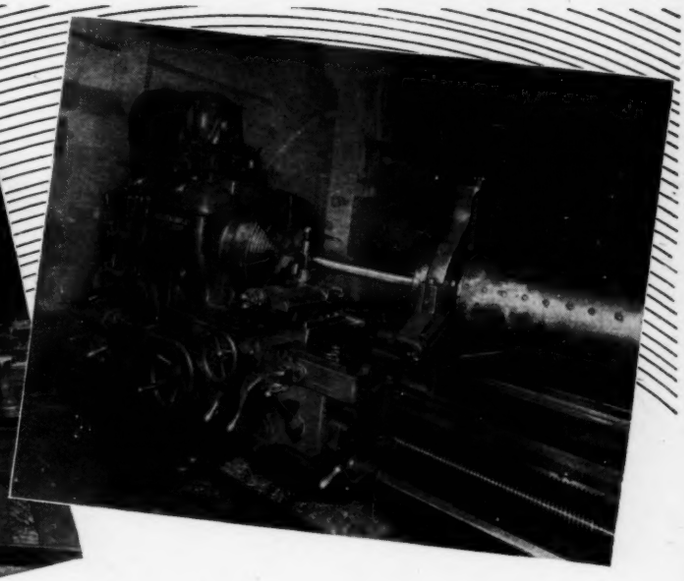


Seele Inclinable Punch Presses Made in 35- and 70-Ton Models

Seele inclinable punch presses are made in two models, 35- and 70-ton near bottom of stroke, by Southwest Tool & Die Co., 2311-2321 Southwest Drive, Los Angeles 43, Calif. They are made with all stressed members continuous from top to bottom to reduce shock and strain to a minimum. A toggle-joint actuating mechanism prevents operation of press until pedal is depressed, and an integral abutment on the releasing latch is said to prevent re-engagement of the sliding-key-type clutch due to overtravel of the crankshaft. An overload device is incorporated to prevent damage to press or dies.

One man can adjust the press to desired position by means of the built-in inclining jack, and normal working height is maintained at all inclined positions. Motor required for the 35-ton model is 3 hp., 1200 rpm. Bolster area is 14x22 in., and stroke is adjustable, standard stroke being 2½ in. The 70-ton model requires a 5-hp., 900-rpm. motor, has 20x30-in. bolster area and a standard adjustable stroke of 3 in. The presses weigh 2600 and 6000 lb. respectively.

LODGE & SHIPLEY LATHES at work...



Output increased over 100%
Time Saved — 50%

at GENERAL MACHINE WORKS, Chester, Pa.

The infinite variety of jobs produced by General Machine Works quickly proves the worth of a lathe. In the illustrations (top right) a shaft is being turned; (top left) a steel forging (SAE-6145-Rockwell "C" 40/45) is being machined; (bottom) a bronze bushing is being machined to a tolerance of .001".

Significantly, Lodge & Shipley Lathes, used on job shop work by this firm, set impressive records . . . "output increased over 100% . . . time saved . . . 50%." This satisfied owner states . . . "If any more lathes are purchased, they will be Lodge & Shipley . . . and our machinists . . . want L & S tools."

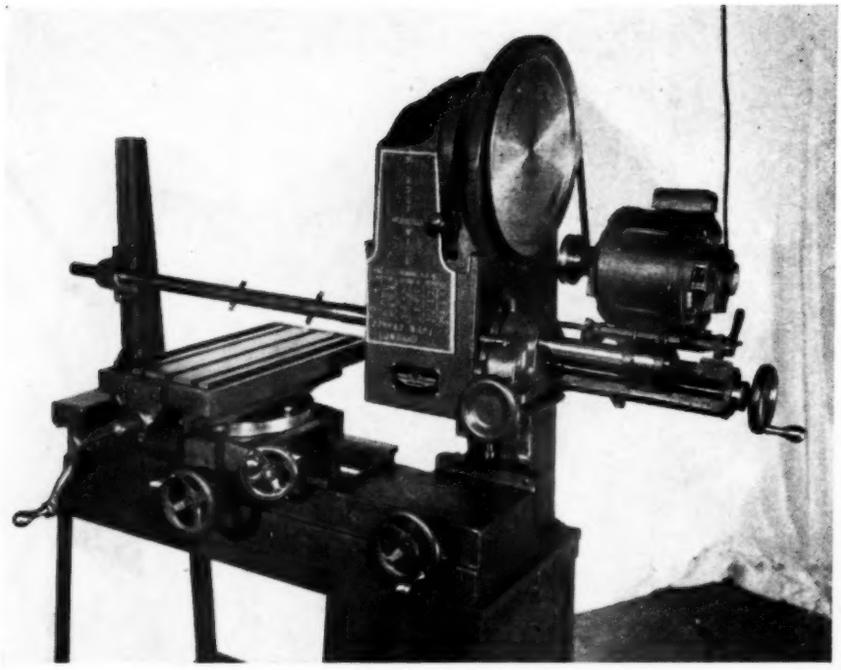
There are more good reasons so many noted manufacturers prefer Lodge & Shipley Lathes . . . your nearby representative will be glad to show you other interesting production and cost studies. Write for Condensed Catalog.

THE WORLD OVER KNOWN FOR GOOD LATHES ONLY L & S LATHES

THE **Lodge & Shipley** COMPANY

CINCINNATI 25, OHIO

MACHINE TOOL DIVISION • 3055 COLERAIN SPECIAL PRODUCTS DIVISION • 800 EVANS ST.



Handwheel provides 0.005 in. per rev. for hand facing on this midget boring mill

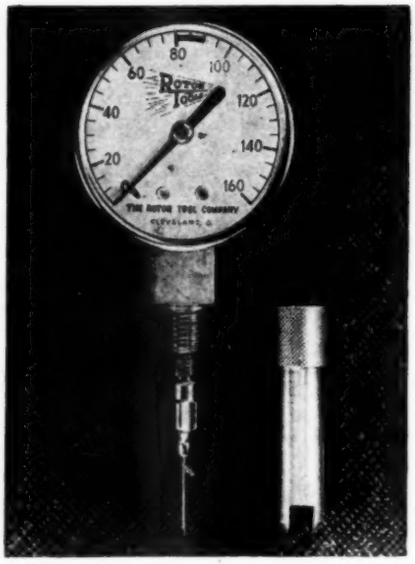
Conrad Midget Boring Machine Provides 16 Speeds, Power Feed

A midget horizontal boring mill has been developed by Conrad Machine Co., Route 53 & Hoy Rd., Lombard, Ill. A bench-type unit, it is available with or without a steel cabinet bench, and it is designed to handle work too small for larger standard machines. It is powered by a ½-hp., 1800-rpm. motor and weighs 800 lb. with bench.

The head is of unit construction, complete with motor and drive. There are 16 speeds from 20 to 825 rpm. Fast speeds are through stepped V-belt sheaves, and low speeds are through the sheaves and back gears.

The machine will handle a 1⅜-in. boring bar and has a No. 3 Morse taper in the spindle nose. Vertical adjustment of the spindle is 12¼ in. above the table and ¾ in. below. Feed is 0.005 in. per rev., and the spindle is equipped for 7 in. of power feed anywhere in its travel. The spindle nose is threaded for milling cutters and lathe chucks. Vertical adjustment of spindle is made by hand.

The rotary table has hand feed only. It can travel 18 in. along the bed with outboard support removed, and 15 in. with support in place. Cross-travel is 15 in. with the collar graduated 0.001 in. The table rotates 360° through 40:1 worm.



Rotor Tool Pressure Gage Shows Air Pressure at Tool

The MSK-55 needle-type pressure gage is announced by The Rotor Tool Co., 17325 Euclid Ave., Cleveland, Ohio. It is designed to show actual air pressure at the air tool while the tool is operating. The gage is inserted in the air hose, usually with hose bent, so that it shows pressure in the hose at the end of the tool while the tool is under full load. This pressure can be considerably different than that shown on the gage at the compressor. Thus if restrictions in air line, fittings or hose have caused a drop in pressure near the tool, the gage detects the drop.

Corlett-Turner G3 Grinder Takes Arbor-Mounted Wheels

The G3 offhand or freehand grinder with individual arbor-mounted wheels and triple speed selection is announced by Corlett-Turner Co., 1001 S. Kostner Ave., Chicago 24, Ill. Each grinding wheel is mounted on a ground tapered arbor which fits into a socket in the spindle. The mounted wheel can be changed in a few seconds without the use of tools by means of a slight wrist motion on the end bells of the grinder head. The reverse motion locks the wheel in place. Wheels are said to run true after being removed and then placed back on the spindle, thus reducing truing.

The speeds are changed by a lever which changes belt position. Speeds are said to suit any vitrified wheel from 1- to 4-in. dia. The machine can also be used for operations including deburring, polishing, buffing, rotary filing, drilling and countersinking. A ¼-in. capacity collet-type arbor is provided along with the mounted wheels. An adjustable lighting fixture is provided to illuminate the work.

ONE important place to start reducing cost is with the machine where goods are made.

Speedier production is very definitely a function of New Departure Ball Bearings.

Operating with less friction, less wear, than other types, the ball bearing is a "natural" for the higher speeds, greater rigidity and improved quality of production, demanded by today's exacting production standards.

Thus, an investment in machines of modern ball bearing design is an investment in faster production — *lower costs.*

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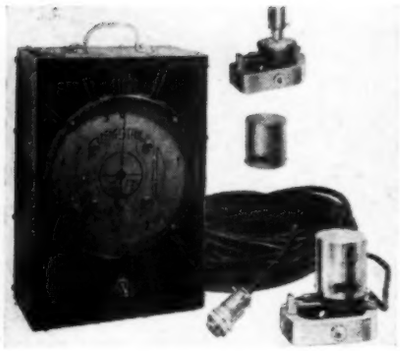
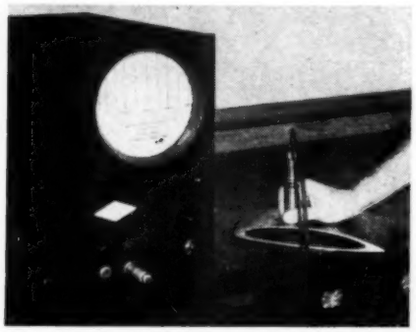


Loads 300 ft. Away Measured With Dillon Pressure Gage

A remote-indication pressure gage and repeater station has been developed to indicate mechanical pressure in vises, chucks, presses, mechanical assemblies and other relatively inaccessible spots by W. C. Dillon & Co., Inc., 5410 W. Harrison St., Chicago 44, Ill. It shows tension in moving filaments, rods and other parts, utilizing a Dillon pressure gage and self-synchronous motors.

The transmitter motor is mounted to the pressure gage as illustrated. When load is applied, its electrical field is unbalanced, and the excitation is carried to the repeater station where the field of the receiving motor is correspondingly unbalanced. The repeater duplicates up to distances of 300 ft. Six models are supplied, covering a total range from 0 to 5000 lb.



Sperry Products Reflectogage Measures Thicknesses to 4 in.

The Reflectogage, which utilizes supersonics for thickness measurement and flaw detection, supplements the Supersonic Reflectoscope and the Thruray manufactured by Sperry Products, Inc., Hoboken, N. J. Thickness of metals and other materials can be measured where access to only one side is available. Maximum error in thickness measurement is said to be less than 2%. Thickness of tubing and flat parts from 0.005 to 0.300 can be read directly from the oscilloscope screen. Parts up to 4 in. thick can be measured indirectly with slight calculation.

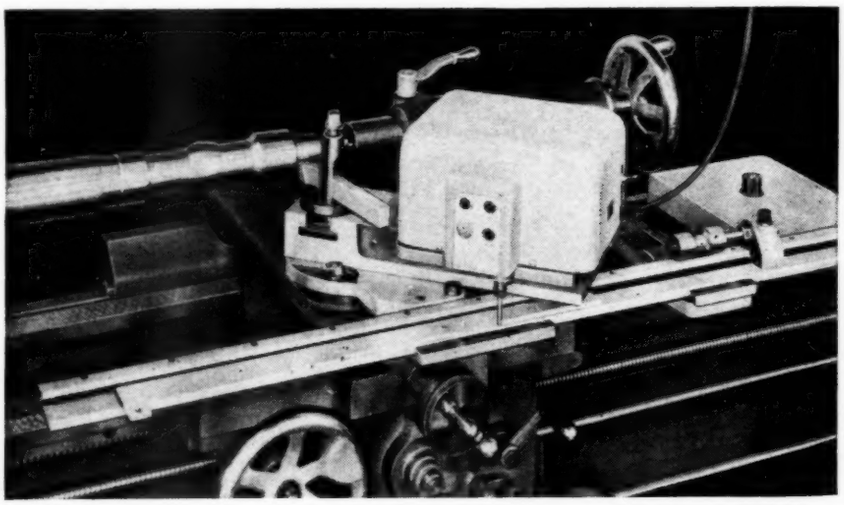
A quartz crystal searching unit is applied to the oiled surface of the part and the oscilloscope pattern observed by the operator. Vertical deflection of the trace indicates resonance of the sound beam within the material. Position of vertical deflection along horizontal axis is determined by resonance frequency and is thus related to thickness.

The gage is also adaptable to production testing of thin pieces, or bonded or clad materials.

Reltool Spiral Center Drill Gives Shearing Cutting Action

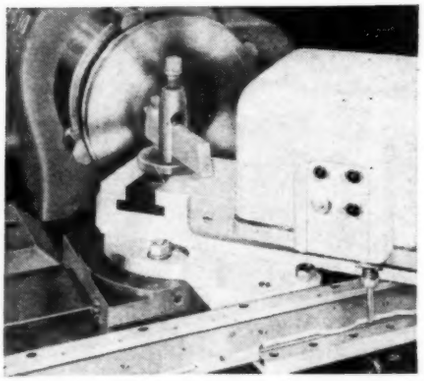
The Spiral center drill and countersink is announced by Reltool Corp., 712 W. Michigan, Milwaukee, Wis. It is designed for long life and to reduce the frequency of regrinding. It has a 22° spiral which results in a shearing cutting action. A large flute results in easy chip clearance.

The Spiral incorporates the Reltool "shockless" feature: a fillet at the point where the 60° countersink angle meets the tip. The tool is furnished with ground flutes, and overall length is slightly greater than conventional center drills.



Profiles, Work between Centers, Duplicated by LeBlond Device

An automatic electric contouring device which can be installed on any LeBlond Regal lathe in ten minutes is available from R. K. LeBlond Machine Tool Co., Dept. AM, Cincinnati 8, Ohio. It can be plugged into the nearest light socket and is said to perform, within 0.0015 to 0.002 in., a range of duplicating operations such as straight facing and turning, tapers of any kind, shoulders, convex and concave surfaces, and spherical surfaces. It is adaptable to duplicating work between centers or profile facing.

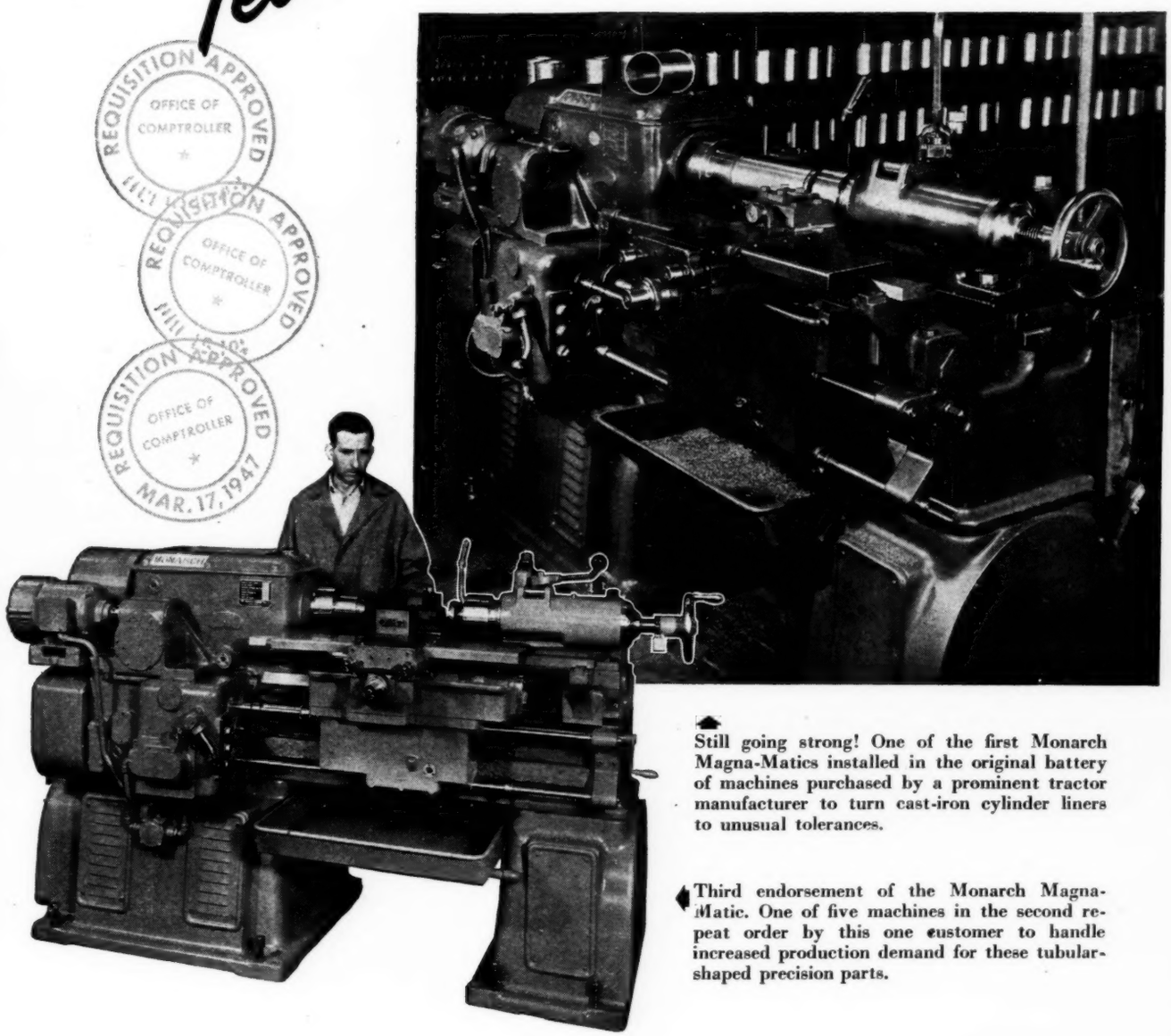


Close-up shows profile-facing templet, stylus pointer, and pushbutton control panel of the contouring device

The templet bar is part of the toolslide and moves in and out with it. This provides constant distance between tool and templet. Thus the diameter can be controlled by regular cross-feed screws. Three electric pushbuttons are for in, out and automatic cycle. With the duplicator slide, which swivels either side of the cross-slide center line, the tool can be fed either toward headstock or tailstock.

Since the device can be easily installed or removed, it does not interfere with normal lathe operation. The slide on which the duplicator is mounted is interchangeable with the standard Regal top slide.

Triple-Tested PRODUCTION METHOD



Still going strong! One of the first Monarch Magna-Matics installed in the original battery of machines purchased by a prominent tractor manufacturer to turn cast-iron cylinder liners to unusual tolerances.

Third endorsement of the Monarch Magna-Matic. One of five machines in the second repeat order by this one customer to handle increased production demand for these tubular-shaped precision parts.

Cast-iron cylinder liners, 4″ diam. x 10″ long, turned to concentricity of .0002″ and a straightness of .0005″ with the center-line of the bore; diameter limit .0005″.

How well the Monarch Magna-Matic meets those tolerances is attested by the repeat orders—three batteries of machines shipped to the same customer.

This adaptation of a standard machine to the specialized production requirements of an individual user is typical of the know-how built into Monarch Metal Turning Equipment. Our engineers will be glad to translate this experience in terms of your needs—to give you *peak production at a profit.* May we hear from you?

THE MONARCH MACHINE TOOL COMPANY · Sidney, Ohio

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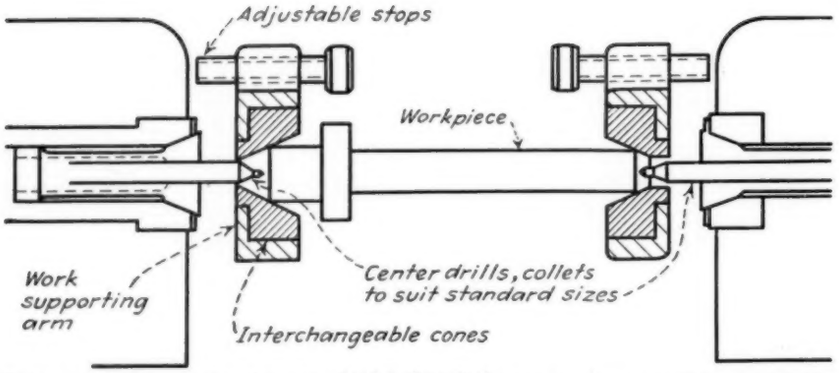
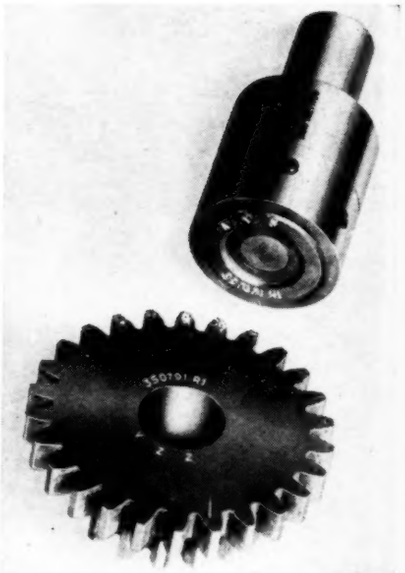
FOR A GOOD TURN *FASTER*—TURN TO MONARCH



Entire centering operation on double-headed unit is done in one movement by bringing movable head or tailstock forward with star handle. Cones centralize and hold work while center drills come into contact. Depth of centers controlled by adjustable stops



STAMPING DEVICE for annular marking uses combination of solid stamp and interchangeable type. Parts like bushings or gears can be stamped around radii with standard information (such as trademark) together with variable data (such as batch no.). Can be used for hand stamping and has adaptor for mounting on presses. It is made by New Methods Steel Stamps, Inc., 147 Jos. Campau, Detroit 7, Mich.

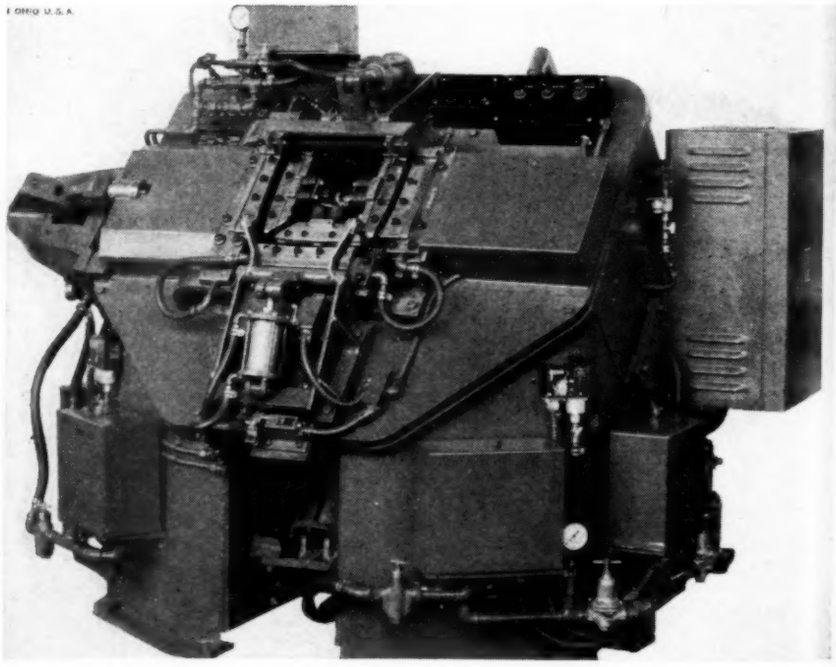
Work Centralized and Centered On Two Manchester Machines

Single- and double-head centering machines made by Manchester Repetition Engineers, Ltd., are distributed by Accreylon Co., 130 W. 42d St., New York 16, N. Y.

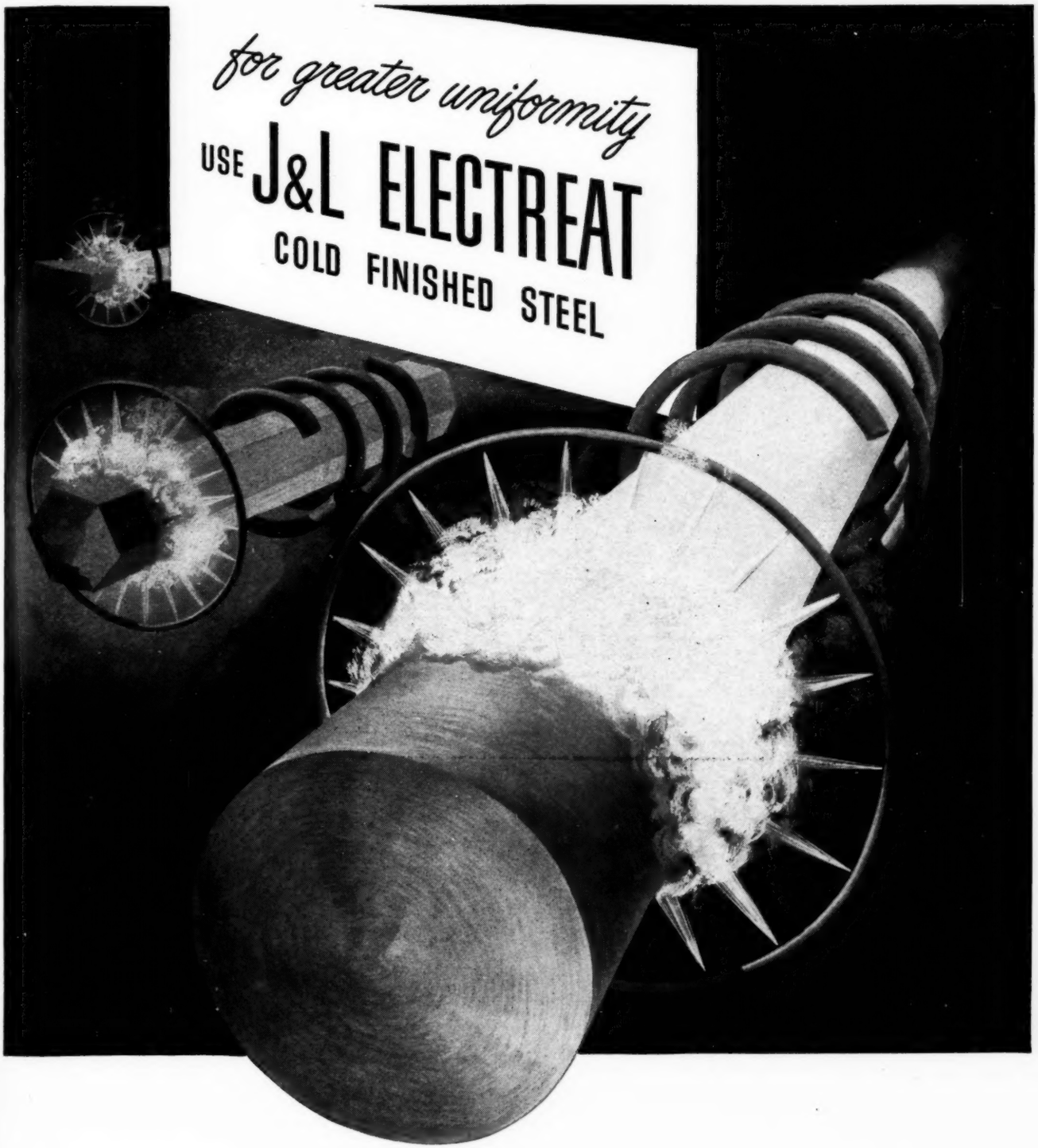
The single-headed unit has one revolving spindle and a tailstock which can be clamped in any position on the bed by means of a lever. A star handle operates a sliding barrel which holds a center cone. The cone holds one end of the work while the other is being centered. Operation of the double-headed unit is similar to that of the single-headed machine.

Both units have a capacity of 3/16- to 1¼-in. dia., with 12-in. max. length. An extended head can increase length to 21 in. Height of the units is 44 in. Head on the single unit is driven by a ½-hp. motor in the pedestal, controlled by push-buttons. A ¾-hp. motor drives the heads on the other unit. Accuracy is said to be within 0.001 in. of concentricity, and speed is up to 500 pieces per hr. A cross-drilling attachment is available.

Double-headed machine centers both ends of work simultaneously



PROJECTION WELDER for high production is made by The Federal Machine & Welder Co., Warren, Ohio. Unit illustrated welds retaining strips and other sub-assemblies to steel stampings forming the main body assembly of typewriters. With one semi-skilled operator, the unit produces approximately 200 assemblies per hr. Mandrel and head are mounted in angular position to facilitate loading and unloading. Assembly is welded in one pass of the machine



The new induction heating method of producing heat treated quenched and tempered cold finished steel makes possible an unusually accurate control of the process. Bars are fed individually through the coil and heated to exactly the desired temperature. They pass immediately through a cone of water sprays which is used to closely regulate the cooling. The Electreat cold finished bars produced by J&L with this process have a degree of uniformity not possible with conventional methods. Write for complete information.

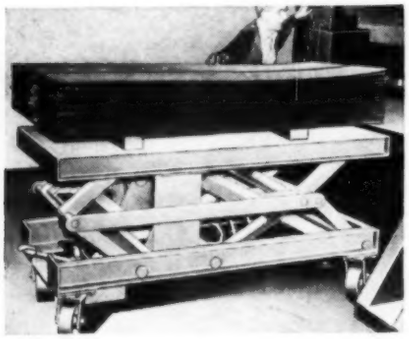
J&L STEEL

JONES & LAUGHLIN STEEL CORPORATION · PITTSBURGH 30, PA.

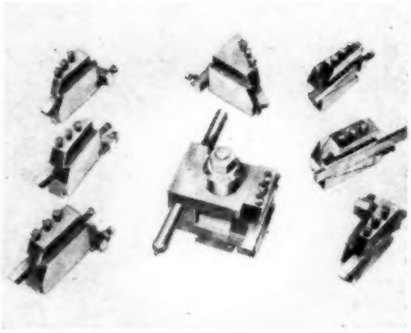
GE Type WP Welding Transformer For Inert-Arc Welding Process

Type WP 220- to 440-v. ac. welding transformer for use with the inert-arc welding process has been developed by General Electric Co., Schenectady, N. Y. While designed for welding aluminum, magnesium and beryllium copper in an argon-gas atmosphere without the use of flux, it can also be used for a wide range of other metals and alloys. It is suitable for manual and machine operation.

The assembly, which is inclosed in a drip-proof case, includes transformer, control panel, capacitors for power-factor correction and arc stabilization, a spark circuit for arc starting, and water and gas solenoid valves. The indicator scale on the front of the welder shows current setting. Current is controlled by turning handle at top. After adjustments, operation is by treadle.



SHEET-FEEDING TABLE feeds sheet steel to presses and shears. Capacity is 10,000 lb., table top is 96x30 in., lowered height is 22 in. and elevated height is 34 in. Lifting action obtained by hydraulic pump through hydraulic cylinders which operate laterally against toggle-lever mechanism. Table loaded by fork truck or overhead means. Made by Lyon-Raymond Corp., 3690 Madison St., Greene, N. Y.

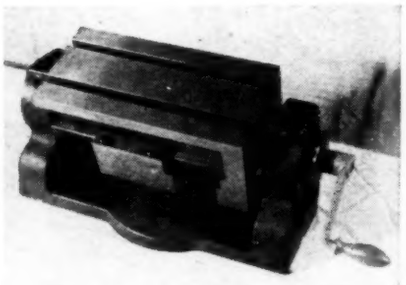


Toolpost for Engine Lathes Provides Quick Tool Change

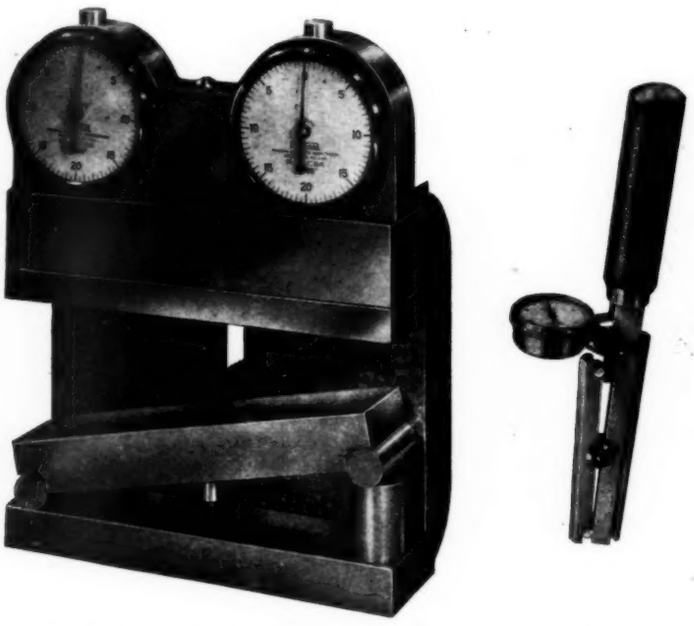
A toolpost for engine lathes which is designed to produce an unlimited number of machining operations from one setup has been announced by A. K. Tool Co., 2029 Blake Ave., Los Angeles 26, Calif. It is said that tools can be changed for different operations in about the same time required to index a turret toolpost.

Each toolholder is equipped with a stop to make adjustment independent of other tools in the setup. Thus a variety of diameters can be cut from one dial setting. One or more tools can be replaced or readjusted without effecting the setting of other tools.

Toolposts are available in sizes to fit lathes from 9- to 24-in. swing. Toolholders take tools from ¼ to 1¼ in. Design permits carbide tooling.



TRUNNION-MOUNTED 5x5x1¼-in. vise backed by 5x10-in. surface plate with 2⅜-in. T-slots. Unit can be rotated 360° and clamped at any angle to accommodate index or angle work for milling, grinding or drilling. Weighs 70 lb. Made by Conrad Machine Co., Route 53 and Hoy Rd., Lombard, Ill.



Minuto Taper Gages Read Outside and Inside Tapers

Outside and inside taper gages have been announced by Minuto Gage & Machine Shop, 3408 N. Palethorp St., Philadelphia 40, Pa.

The outside taper gage (left) has a body of meehanite with hardened, ground and lapped working surfaces. It incorporates a 4-in. sine bar and two dial indicators. With the use of Jo-blocks, it is said that any tapers up to 5 in. per ft. can quickly be measured. Most jobs can be checked without removing the work from the machine, which is said to save at least 80% of checking time. Dimensions of the unit are 2⅝x4⅝x6½ in.

The inside gage (right) is made of Nitralloy steel and incorporates a 4-in. sine bar and one dial indicator. With the use of Jo-blocks, tapers up to 45° can be read at a glance.

TAPS WITH DRILL OR REAMING SECTIONS
LONG TAPS AND SHORT TAPS
TAPS WITH SHORT OR LONG CHAMFER
STEPPED TAPS AND STRAIGHT TAPS
LARGE TAPS AND SMALL TAPS
SPIRAL POINTED OR INTERRUPTED THREAD TAPS
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THREAD GAGES & SPECIAL THREADING TOOLS, MACHINES AND CHECKERS

You can recondition all these taps ON A DETROIT

TAP RECONDITIONER

Having one of these DETROIT 4 in 1 tap reconditioners in your shop is just like getting an almost unlimited supply of NEW TAPS for next to nothing. With this simple low cost machine you can quickly put your worn taps back in first class condition. The machine will chamfer the taps, grind from 2 to 6 flutes, spiral point them where required and polish the points. Pays for itself in a remarkably short time. Write today for complete descriptive Bulletin #DTR-3.

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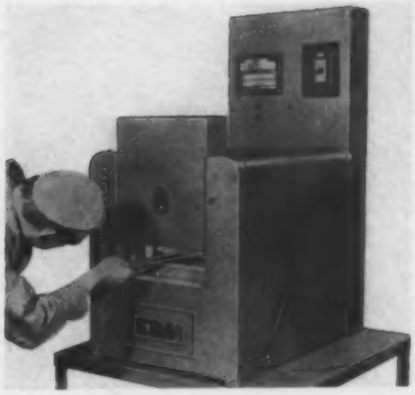


Cooley VK-5 Electric Furnace Has Range from 300 to 2000 F.

The Model VK-5 electric furnace is available from Cooley Electric Mfg. Co., Indianapolis, Ind. It is said to provide accurate temperature control in its range from 300 to 2000 F., and can operate continuously. It is suitable for heat-treating of small parts, tools and dies, and it heats from cold to 2000 F. in 1½ hr. The chamber is 8x6x14 in., and the furnace has 4650-w. power capacity. The Cooley selective-power modifier is used in combination with an indicating-controlling pyrometer, and an automatic-control panel is available. A vertical lift door makes it possible to conserve heat when small parts are frequently removed.

RUNNING TIME meter has counter that can be reset to zero, operates on ac. circuits. It automatically registers total operating time or idle time of any circuit, machine or system to which connected. Made by The R. W. Cramer Co., Inc., Centerbrook, Conn.

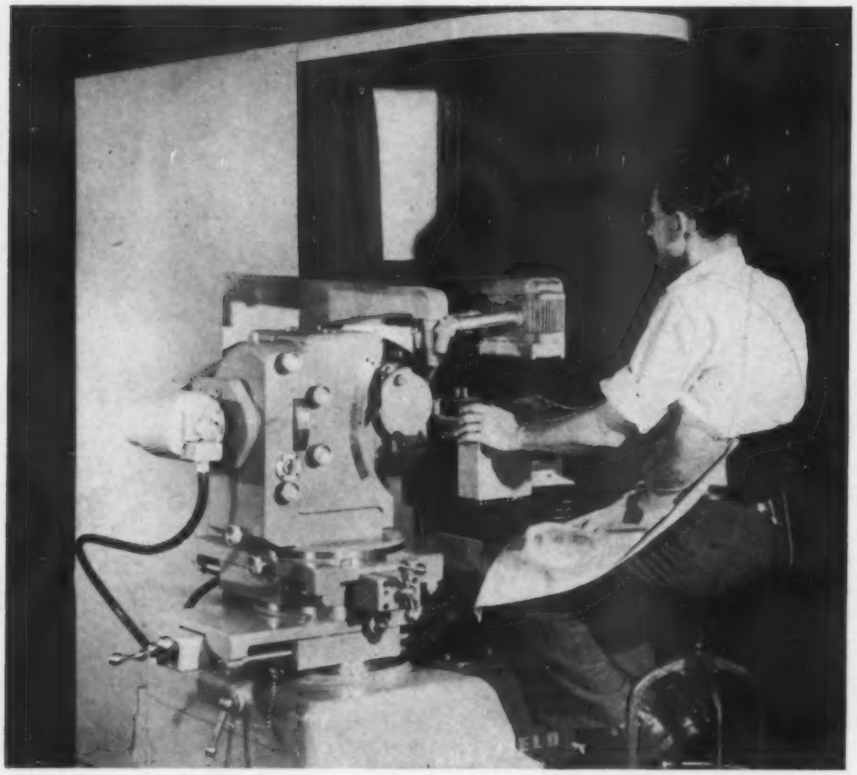
Acme Broach Hydraulic Press Performs Three Types of Work

A 6-ton hydraulic press has been developed by Acme Broach Corp., E. 3rd St. at Delaware, Lexington 17, Ky. The 5-hp. motor required for the unit can be mounted inside the column. Depth of the column is said to provide enough rigidity to eliminate deflection.

The press can perform the work of three different types of machines. With the standard worktable, which has 10x25-in. workplate, it serves as a hydraulic broaching or forcing press. If the table is removed, it can serve as a horning press. By mounting various types of tables, it can be used as a straightening press.

Control is by pedal or by a lever which can be adjusted so that the operator can sit. When either control is released, the ram returns to "up" position. Stroke is variable to 24 in. max., and is controlled by stop dogs. Maximum space between table and ram is 30 in., and the work end of the ram is tapped 2 in.-8P. Diameter of the ram is 2½ in. Down speed is 26 fpm., and up speed is 36 fpm.

Oil is placed in the machine by removing a plate at the back. This would eliminate tampering. An oil-pressure gage is mounted on the column at eye level. A pushbutton switch is incorporated for starting and stopping the motor. A variable-speed control valve for ram speed control is available.



PROJECTOFORM grinder incorporates optical system which uses either contour or opaque projection with surface illumination and 25:1 or 50:1 optical magnification. A prism in the system places image in natural position. Remote movement of wheelhead of the grinder is accomplished hydraulically, and operator can sit before projection screen while operating micrometer wheels. Operator sees work and wheel in natural colors amplified on screen. Made by The Sheffield Corp., Dayton 1, Ohio

how to lengthen the life of machine tool parts by Airco flame hardening

Part: Bed Extension Ways.

Material: SAE-4340.
Hardness Obtained: 62 Rockwell "C" 86 Scl.

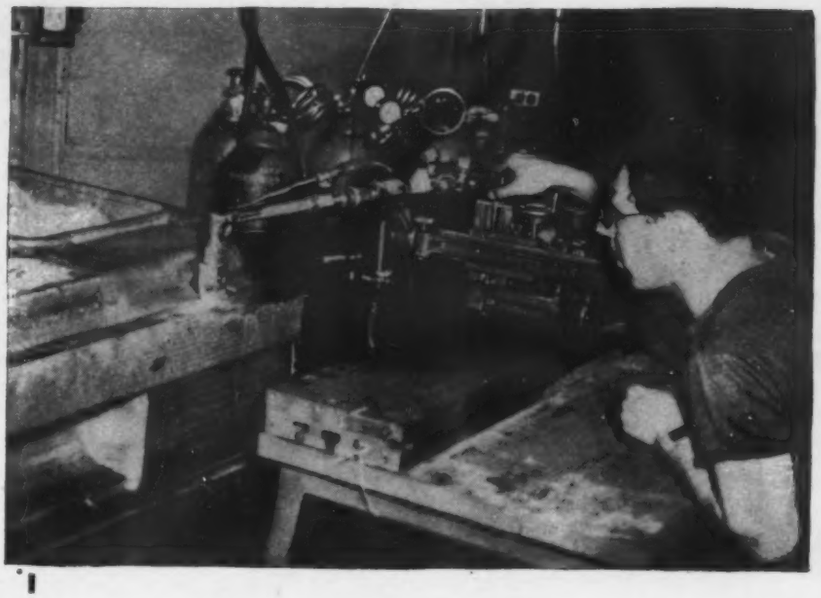
Depth of Case: 1/16 inch.

Set-Up Time: (Total, for 8 operations): 3 hours.

Cycle Time: 8 passes. 2½ hours.

Distortion: None measurable.

Performed with work secured to positioning table, torch mounted on Airco Radiagraph cutting machine adapted to flame hardening. Standard Airco tips, universal adjustable yoke and right-angle attachments used.



8 surfaces of bed extension ways flame hardened in 5½ hours (including set-up)

HOW IT WAS DONE — Outer edges were treated with a one-inch-wide standard flat tip, on a right angle attachment. Inner edges were handled in same way, by raising positioning table. On top surface of ways a four-inch-wide tip was used. Under edges of ways were treated with special flame hardened tips. In each case, the other way was treated by revolving the work 180°, with no other change in work or torch positioning. Use of rotating positioning table greatly cut set-up time. Use of Airco Radiagraph insured uniformity in both hardness and depth of case.

Because of mass of the part, an auxiliary quench was used in all eight operations. As a result, no measurable distortion occurred.

Proper flame hardening is *the* economical method of lengthening equipment life. It does not effect properties of the core — wear-resisting surfaces are produced while still retaining the toughness and ductility of core material. Distortion is so negligible that hardening is normally done after finish grinding.

Airco flame treating can be economically applied to single parts or to units in mass production. Normally standard machine tools, with standard Airco oxyacetylene equipment, are all that is needed.

If you are making or using parts that will give longer life when surface hardened, fill in and mail the coupon and we will promptly forward copies of Oxyacetylene Flame Hardening Handbook, and Flame Hardening Apparatus Catalog No. 90: Air Reduction, General Offices, 60 East 42nd Street, New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, General Offices: Houston 1, Texas. Represented internationally by Airco Export Corporation.

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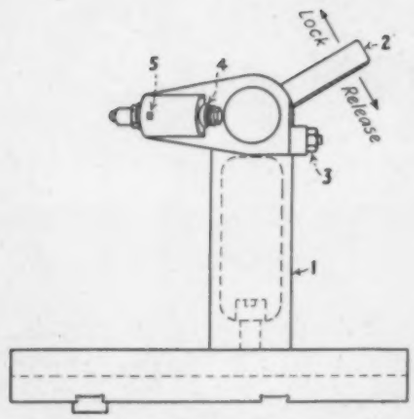
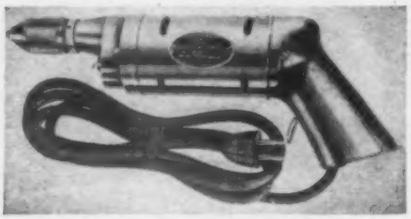


Repetitive Dressing Performed By Tru-Matic Wheel Dresser

The Tru-Matic wheel dresser has been developed by Erickson Tools Div., 2309 Hamilton Ave., Cleveland 14, Ohio. Designed primarily for use in repetitive precision production, it does not have to be removed from the machine. Movement of the locking lever permits the diamond to be turned back out of the way.

The dresser is first set on the machine and the column (1) is adjusted in relation to the internal-grinding spindle so as to clear when the diamond is in release position. The diamond is placed in lock position by means of the handle (2), and then it is adjusted for height by means of locknut and screw (3).

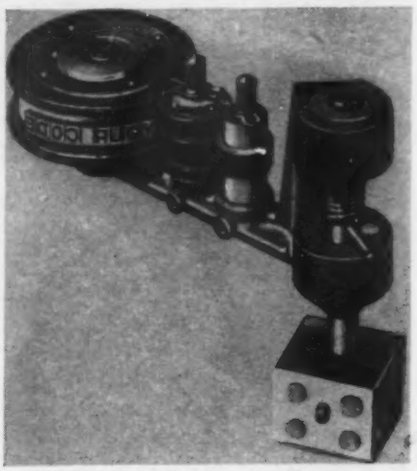
Adjustment is made for automatic sizing by means of the column (1) for approximate adjustment, and by the diamond collet chuck (4) by loosening the setscrew (5) for close adjustment. The dresser is said to repeat position exactly.



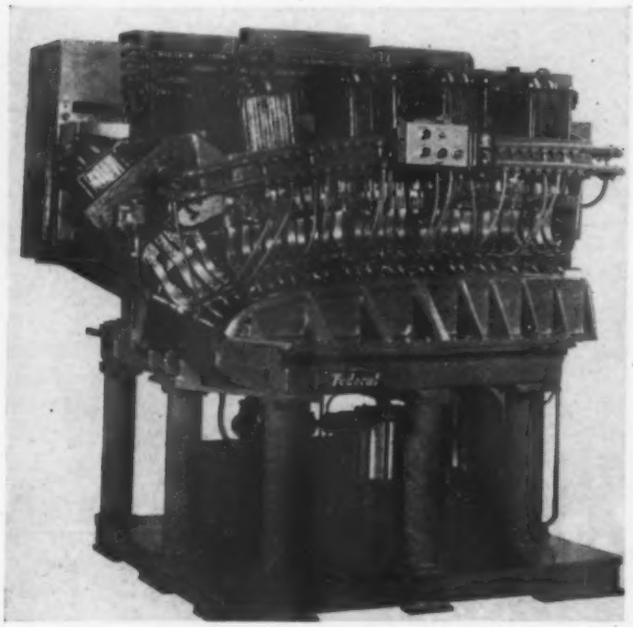
Portable Electric Tools Makes Lightweight Pistol-Grip Drill

The lightweight Hi-Power Model No. 77 portable electric drill is introduced by Portable Electric Tools, Inc., 255-59 W. 79th St., Chicago 20, Ill. The unit weighs 3 lb. 8 oz. and its housing is made of seamless aluminum tubing. Over-all length is 11 in.

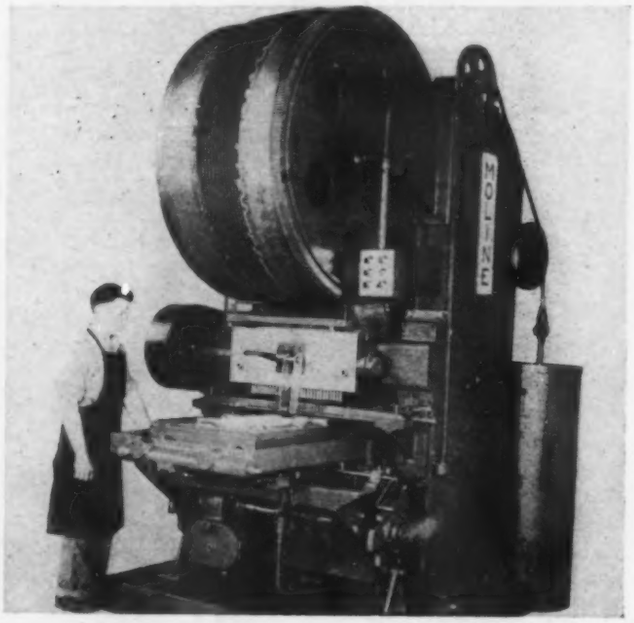
Capacity is ¼-in. drill in mild steel, and a Brown & McLaren screw-on chuck is incorporated. A Jacobs Hand Tite chuck can be had on request. No-load speed is 1700 rpm., and speed under full load is 900 rpm. The motor is a Universal ac.-dc., 110-v. air-cooled unit.



ROLACODER JR. marks cartons, cans, rolls of textiles and paper. Is attached to packaging, processing or other handling equipment where objects to be marked are firmly positioned while moving. Interchangeable rubber-type surface inked automatically after each imprint. Two models print one or two lines. Made by Adolph Gottscho, Inc., 1 Hudson St., New York 13, N. Y.



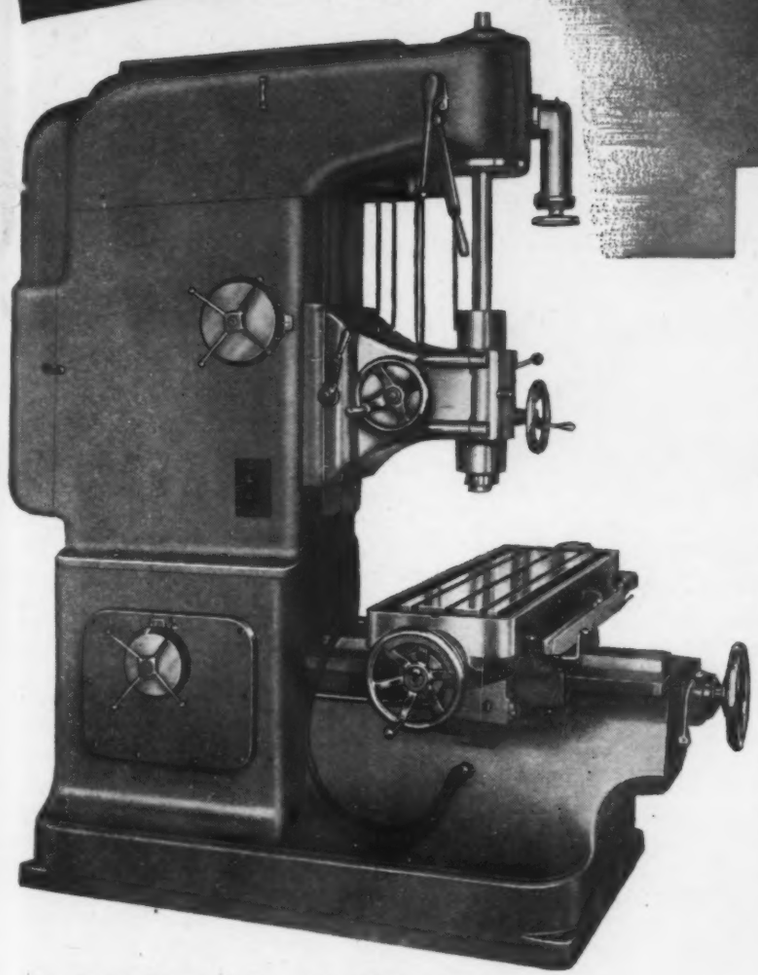
MULTI-POINT SPOT-WELDING machine welds automobile front-fender stampings to fender rails, completes over 40 assemblies per hr. Fixture stroke of 6 to 8 in. permits ease of loading, unloading, dressing or changing of dies. Indexing of fixture, operating of 32 welding guns, welding, reversing of these operations, and unclamping are automatic. Clamping is by separate pushbutton. Made by Federal Machine & Welder Co., Warren, Ohio



29-SPINDLE MACHINE for automatic drilling of aluminum header plates. Drum-type spindle selector, which is synchronized with indexing of the worktable, permits setup for any hole pattern within range of machine. A maximum of 9657 holes can be drilled in one operating cycle. Header plates are stacked in pairs, and one pair is drilled with each cycle. Table can index sideways to provide close spacing of holes. Made by Moline Tool Co., Moline, Ill.

Fast, Accurate Production More Economically with the New No. 50

PRECISION BORING and VERTICAL MILLING MACHINE



The unusual production economy of the new Knight No. 50 is achieved by combining, in a single solid base machine of exceptional range, all the features required for both precision boring and vertical milling. The elimination of time-wasting extra setups and transfers of work save costly labor and make possible much higher output at far lower costs. With a working capacity of greater range than other machines of comparable size, there is also power to spare in the rugged No. 50 for easily and speedily handling the toughest jobs in any shop.

- *16 Spindle speeds from 40 to 2000 r.p.m.*
- *9 Spindle feed from .005" to .010"*
- *100" per minute table traverse, both directions*
- *16 Table feeds, 5/16" to 20" per minute*
- *7½ H. P. drive*

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KNIGHT VERSATILE MILLERS ACCURATE RIGID

MORE GOODS for MORE PEOPLE at LOWER COST

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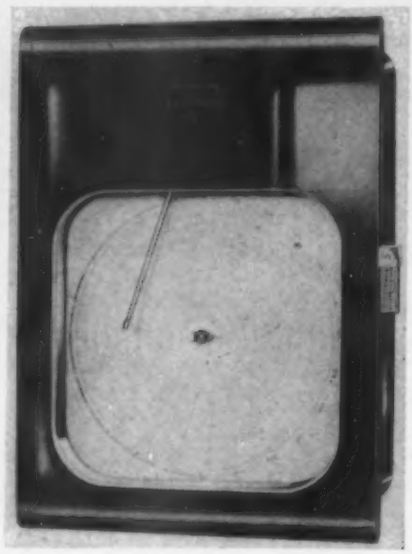
Automatic Wrench Made by Fen Operates Chuck Jaws by Lever

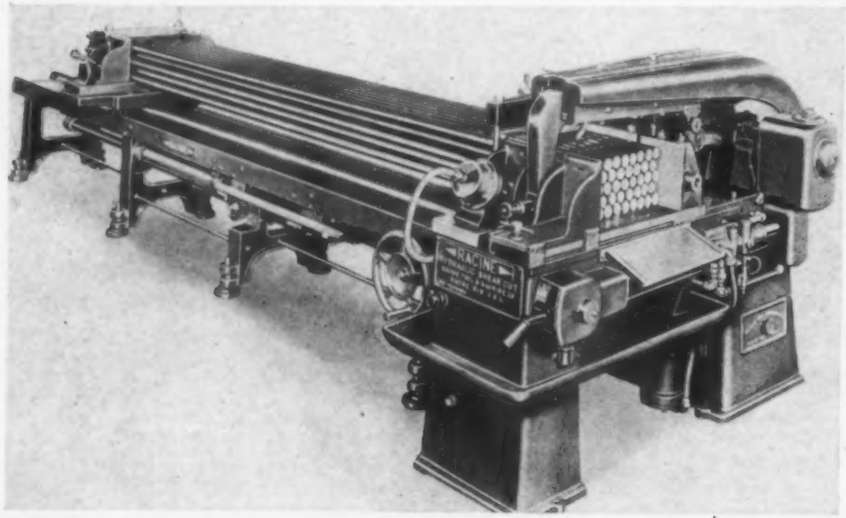
An automatic wrench consisting of a variable-torque motor operating a retractable spindle is made by Fen Machine Co., Dept. 1, 1350 Babbit Rd., Euclid, Ohio. Two models have maximum torque capacity of 4000 and 6000 in. lb. A selector wheel on the side of the housing permits the operator to select and hold desired torque from zero to maximum capacity. This regulates gripping pressure.

Downward movement of the control lever engages wrench spindle in chuck pinion. Left and right movements of the same lever operate a momentary switch which energizes the motor for gripping or releasing the work. A brake applied to either direction of motor operation prevents "overrun." This permits the operator to restrict movement of chuck jaws within close limits. In four-jaw chucking, each jaw can be advanced or retracted, and the operator can also "jog" each jaw until proper working position is obtained.



Recording Thermometers, Gages Made in Two Sizes by Bristol

The Series 500 line of recording thermometers and gages is announced by The Bristol Co., Waterbury 91, Conn. With new cases, simplified construction and other improvements, the units incorporate the same basic principles of the former models. They are available in 8- and 12-in. sizes in a wide variety of ranges.



AUTOMATIC STOCK-FEED machine has 10x10-in. capacity, is a production-type unit. Operation is hydraulic, and it handles bundled stock and single bars. A 6x6-in. machine is also available. Made by Racine Tool & Machine Co., 1760 State St., Racine, Wis.

Stationary Grinding Possible With Wyco Flexible-Shaft Unit

The Wyco Tool Maker's Streamflex has been added to the line of flexible-shaft machinery made by Wyzenbeek & Staff, Inc., 838 W. Hubbard St., Chicago 22, Ill. The V-belt drive of the unit is enclosed by a sliding ventilated pulley guard which can be raised when speeds are changed. A locking shaft holder holds grinding wheel and shaft in fixed position for stationary grinding.

Applications include grinding, sanding, polishing or rotary file work on molds, patterns, dies or on stainless-steel fabrication. There are four 1/3-hp. bench- and floor-type machines, in standard- or high-speed ranges, plus a ½-hp. floor-type machine. Standard speeds are 1400, 2400 and 4500 rpm., while high speeds are 1800, 3600 and 7200 rpm.

Hard-Surfacing Performed By GE Type W-94 Electrode

Electric Welding Div., General Electric Co., Schenectady, N. Y., announces Type W-94 electrode for hard-surfacing applications where resistance to impact, wear and abrasion is required. Available in 14-in. lengths with diameters of ¼, 3/16, 5/32 and ⅛ in., it is said to work harden to over 50 Rockwell C. It operates on ac. or dc. reverse polarity.

IT'S THE OUTPUT PER SPINDLE *That Counts!*

TIMED CYCLE CONTROL ON BARNESDRIL UNIT-TYPE MACHINES FURNISHES GREATER OUTPUT PER SPINDLE

Closeup View of Tooling and Fixture. Timed Cycle Saves Handling Time, Increases Uniformity of Pieces, Reduces Inspection on the Job. Production equals 2 Pieces per Spindle per Min.

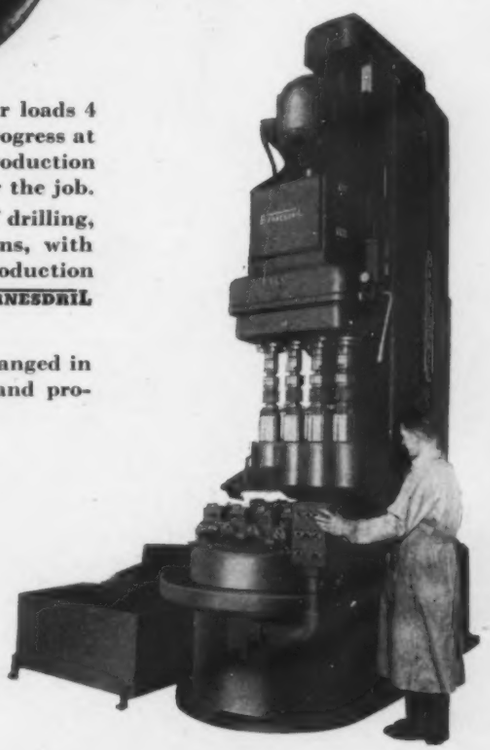
No. 20 BARNESDRIL Vertical Hydraulic Production Unit. Interchangeable fixtures, heads and tooling provide for machining 6 different parts on this one machine.

● Almost any desired rate of production is possible if sufficient volume of production equipment is available. It is practical economy, however, to secure maximum output from each unit on the production line in order to realize lowest investment cost.

Here is a case in point! These steel forged yokes are hollow milled from rough forgings in one operation on a BARNESDRIL No. 20 Vertical Production Unit Machine. Production is continuous, at the rate of 2 pieces per spindle per minute, and the operator loads 4 pieces at one station on the automatic index table, while machining is in progress at the second station. Simplified job operation, faster handling and greater production efficiency are a result of the timed cycle control, engineered particularly for the job.

BARNESDRIL Hydraulic Production Units are adaptable to a large variety of drilling, reaming, tapping, threading, facing, counterboring and milling operations, with similar savings and efficiency. Fewer spindles are needed to give the production required, and consequently, machine investment is lower. Consult your BARNESDRIL representative for details on application to your production problems.

ASK for a copy of Bulletin B-1504. Hydraulic Production Units may be arranged in vertical, horizontal or angular groups to suit the number of operations and production required. Send us blueprints for production estimates.



DRILLERS BARNESDRIL HONERS

40 YEARS OF DISTINGUISHED MACHINE TOOL SERVICE

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CHICAGO, SEPTEMBER 17 - 26 — Booth No. 42

BARNES DRILL CO.

830 CHESTNUT STREET ROCKFORD, ILLINOIS U.S.A.

YES, you can save up to 20% on a brand new set of Ellstrom Chromium-plated Gage Blocks simply by trading in your worn set under Ellstrom's liberal exchange plan. Here's how it works . . .

(1) If you have a used set of rectangular Ellstrom blocks, you get a 20% trade-in allowance on a brand new duplicate set.

(2) On worn rectangular blocks of any other make, you get a 10% trade-in allowance.

(3) Used sets of square type blocks bring you a 10% trade-in allowance regardless of make.

(4) Or, if you have any number of individual blocks in need of replacement, the same discounts will be allowed on the price of replacement.

NOTE: All discounts are based on existing W prices.

Under this liberal exchange plan, you can keep your old blocks until we deliver your new ones—each having the inimitable Ellstrom feature of Chromium plated gaging surfaces to assure you of longer wearing millionths!

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Originators of Chromium Plated Gage Blocks

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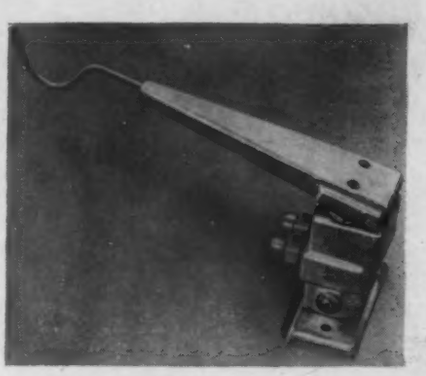
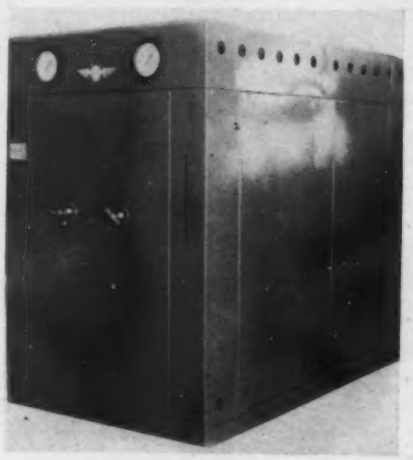
MEASURING IN MILLIONTHS FOR 3 GENERATIONS

Make use of our dependable inspection service.

PARTS and MATERIALS



SHUTOFF VALVE cuts down argon consumption in production Heliarc welding. Known as Oxweld V-30, it is made by The Linde Air Products Co., Unit of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y. Valve controls both argon and water supply at pressures to 100 psi., is operated by extension lever on which torch is hung when not in use



Presses Actuated by Greer's Hi-Lo Pressure Power Pack

The Hi-Lo pressure power pack for actuating huge presses has been developed by Greer Hydraulics, Inc., 454 18th St., Brooklyn, N. Y. Designed especially for specific requirements of Norton Co., it can produce a flow of 124 gpm. at 2000 psi.

The hydraulic circuit is powered by a dual-shaft, 30-hp. electric motor, one end of which drives a low-pressure pump with 36-gpm. capacity, while the other end drives a high-pressure pump with 12-gpm. capacity. Low-pressure fluid is stored in three 10-gal. accumulators and is said to be released instantaneously

It's a labor-saving SKIL DRILL* . . . gives you the speed you need for all ½ inch drilling in steel, 1 inch in wood. And back of its excellent performance are sound engineering, good design and a quarter-century of outstanding SKIL TOOL service. Whether you buy this drill or any one of 19 other SKIL DRILLS, you'll find you've never bought a better tool.

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GLOVE-FIT PROTECTION AGAINST SPLASH ... This Over-All® rubber goggle with snug fitting resilient rolled edge takes the danger out of splash and spatter; provides wearing comfort over spectacles.

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PRODUCTS, INCORPORATED

235 WASHINGTON STREET, READING, PA., U. S. A.

when the system needs it. High pressure fluid is stored in two 10-gal. accumulators. Low-pressure accumulators operate between 300 and 200 psi., and the others operate between 2500 and 2000 psi. The circuit is intermittent-duty type.

Southern Cross ¼-hp. Motor Made for Continuous Duty

A ¼-hp. single-phase motor is announced by The Southern Cross Mfg. Corp., 1028 Connecticut Ave., Washington 6, D. C. It features: continuous duty, reversible rotation, and resilient mount. Speed is 1725 rpm., shaft dia. is ½ in., and over-all length is 10½ in. Double fans, exposed laminations and specially ventilated end bells are incorporated for cooling purposes. The motor operates on 60 cycle, 115 v. current.

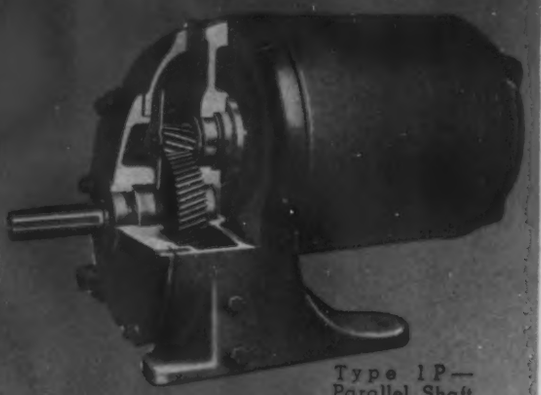
Other standard split-phase and capacitor motors are available in ⅛, 1/6, ¼ and 1/3 hp. Motors operate at any angle, are adaptable to any tool or appliance.

Standardized Hydraulic Units Improved by Hannifin Corp.

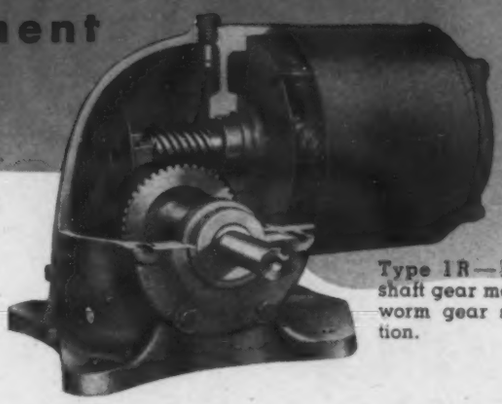
Improved, standardized, streamlined, hydraulic-power units are announced by Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill. They are designed for use with hydraulic cylinders and other hydraulically

CENTURY
Fractional Horsepower
GEAR MOTORS

Are Engineered to Maintain the High Torque Slow Speed Shaft in Rigid Alignment



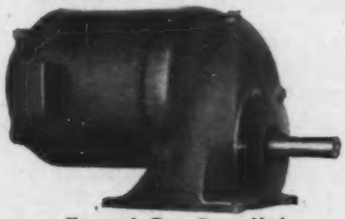
Type 1 P—Parallel Shaft Gear Motor, one step speed reduction.



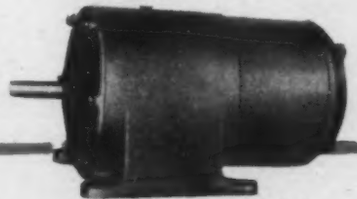
Type 1 R—Right angle shaft gear motor, one step worm gear speed reduction.

Type 1 R—Right angle shaft gear motor, one step worm gear speed reduction.

Type 2 R—Right angle shaft gear motor, two step speed reduction—one step helical gear, one step worm gear.



Type 1 P—Parallel shaft gear motor, one step helical gear reduction.



Type 2 P—Parallel shaft gear motor, two step helical gear reduction.

The mounting feet of Century Gear Motors are an integral part of the rugged compact gear housing—provides a strong, rigid unit. Additional mechanical strength is achieved by locating the shaft close to the base of the gear housing. This method of construction holds the high torque slow speed shaft in rigid alignment, and reduces stresses.

The motor is equipped with ball bearings. Large taper roller bearings in the gear unit handle heavy radial or thrust loads.

Century Gear Motors are built in standard sizes from 1/8 to 3/4 horsepower — single phase, polyphase and direct current.

Century's line of fractional horsepower gear motors has gained an enviable reputation for outstanding performance. Many thousands of them have been put into service since their introduction eight years ago.

Specify Century Gear Motors for all your fractional horsepower slow speed requirements.

Century C MOTORS

CENTURY ELECTRIC CO.
1806 Pine St., St. Louis 3, Mo.
Offices and Stock Points in Principal Cities

360

We make DOUBLY sure that every tooth is cut clean and sharp

This precision machine automatically cuts the teeth of "American Swiss" Swiss-Pattern Files with a tolerance limit of ±.002-in. for many shapes. But notice how closely and carefully the operator is watching—he takes no chances of any imperfection. Machine accuracy *plus* experienced skill are your assurances of perfect files when you buy "American Swiss".

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Elizabeth 1, New Jersey

Buy From Our Authorized Distributor.

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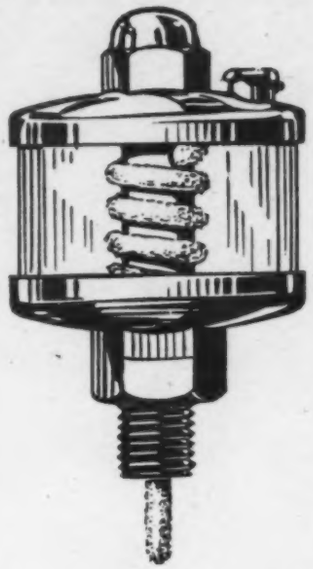
operated equipment. Standard equipment includes pump, pressure-relief and -adjusting valves, hydraulic pressure gage. The units provide for any pump capacity above 1 gpm., and for pressure to 2000 psi. or more. Standard motors are used.



Visible Oil Supply Provided By Oil-Rite Wick-Feed Oiler

A Wick-Feed oiler for feeding filtered oil is announced by Oil-Rite Corp., 3486 S. 13th St., Milwaukee 7, Wis. It is available in five sizes with capacities from ½ to 8 oz. Oil in the Lucite reservoir is carried through the wick over the stand pipe to the bearing by capillary action assisted by a siphon effect. Applications include continuously-operated bearings, dusty surroundings.

Anderson's High-Speed Coolant Used with 10 to 75 Parts Water

Lusol, a liquid concentrate used with 10 to 75 parts of water has been developed by Anderson Oil Co., Inc., Portland, Conn. A coolant for high-speed production on tough alloys, it is said to make a true solution and not to evaporate or become rancid. Low interfacial tension is claimed for the substance, which would permit it to rapidly get between tool and chip to prevent the formation of heat.

Globe Imperial's Plastic-Seal Protects Surfaces from Damage

A plastic-dip coating, Plastic-Seal, for protecting surfaces from rust, corrosion and damage, is announced by Plastic-Seal Div., Globe Imperial Corp., 2014 Kishwaukee St., Rockford, Ill. Properties of the material

Properties that *Count* in a soluble oil

You get them all in

GULF SOLUBLE CUTTING OIL

- Helps keep cutting tools sharp, grinding wheels clean
- Highly stable—in use or in storage
- Helps prevent gummy deposits
- Helps prevent rust
- Emulsifies readily with all but the hardest water
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- Nonfoaming

Facing and turning operation on steel forging, typical of the diversified machining jobs where Gulf Soluble Cutting Oil helps improve production and increase tool life.

THESE properties are combined in Gulf Soluble Cutting Oil to help you get greater production efficiency over a wide range of cutting, milling and grinding operations.

Call in a Gulf Lubrication Engineer and ask him to recommend the proper concentrations of Gulf Soluble Cutting Oil for your particular requirements. For further information on Gulf Soluble Cutting Oil—and for one of Gulf's practical slide-rule-type calculators, which will help you maintain desired soluble oil concentrations—send the coupon at right.

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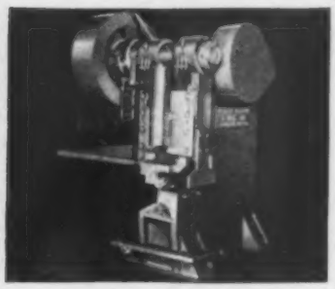
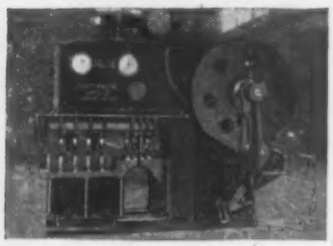
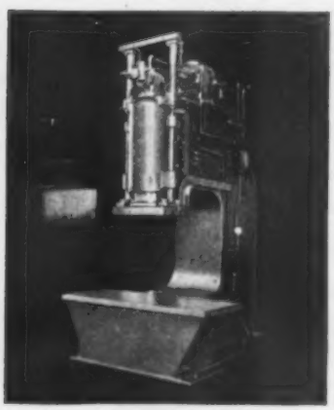
BEATTY Hydraulic Vertical Bulldozer for heavy forming and pressing.



BEATTY Single End Bar Shear available in capacities up to 300 ton.



BEATTY No. 14 Toggle Beam Punch for structural steel fabrication.



BEATTY 250-Ton Gap Type Press for forming, bending, flanging, pressing.

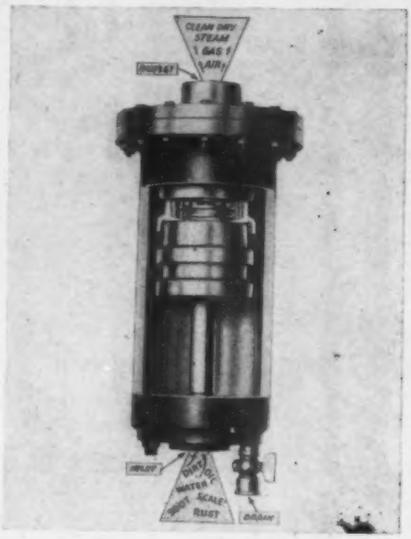
Beatty engineers have designed and built such a wide range of heavy metal working machines that often, with only a minor change, one of these units can be adapted to solve a *special* problem. When this is done, you get what amounts to a *special* unit, the solution to a *special* problem, for approximately the cost of a *standard* machine. Whenever you have a heavy metal working problem, it pays to come to BEATTY. There is usually a *better way* to handle any fabricating problem. Our engineers are well qualified to help you find that *better way*.

HYDRAULIC HEAVY METAL WORKING EQUIPMENT

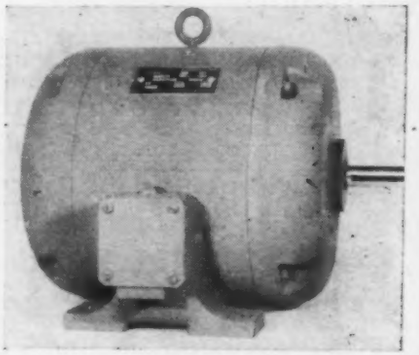
BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA

result from refinements in the basic formula of ethyl cellulose compounds. Features include: controlled variable thickness of coating from 0.045 to 0.064 in., and the use of red, blue, and green colors in addition to water-clear coating.

Coating is applied by dipping in molten Plastic-Seal at 350 to 370 F. When removed from dip, the mass of the object absorbs the heat, leaving a smooth transparent coating which permits easy handling, storing and identification.



AIR SEPARATOR, Model E, is designed to deliver clean, dry steam, gas or air. Has no moving parts, screens or filters; uses mechanical operation. Capacity is 250 cfm., and dimensions are 8-in. dia. × 15 in. high with 1½-in. standard pipe connection. Made by Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.



THREE-PHASE motors in 1½-, 2-, and 3-hp. sizes are made by Kato Engrg. Co., Mankato, Minn. Units are totally enclosed, use rolled sheet-copper bars in squirrel-cage rotor. Readings of 1½-hp., 1160-rpm. motor average as follows: 2.6 amp., 440 v., 67% power factor, 6.9 ft. lb., 60 cycle

CAPACITY:
Profiles up to 6" in length. Circular work up to 4" in diameter. Flat pieces up to 2" in thickness.

TUNGSTEN CARBIDE can also be ground on this machine.

Get accuracy to 0.0002" on tools, gages, dies, templates and all types of small parts! The Studer Profile Grinder saves time by grinding parts complete in one operation – with one wheel, eliminates preliminary grinding to form on many small profiles. Write for complete information.

COSA CORPORATION

624 Chrysler Building

New York 17, New York

KELLER

POWER HACK SAWS

CUT CUTTING COSTS

No. 3 Hy-Duty

$370 including motor F.O.B. factory

SPECIFICATIONS:

Capacity, 6¾ x 6¾ inches.
Vise swivels to 45 degrees.
Capacity at 45 degrees, 4 inches.
With automatic safety stop switch.
With feed control.
With foot lift to saw frame.
Automatic lift on reverse stroke.
With coolant tank and pump.
Length of blade, 12 to 14 inches.
Two speeds available, by shifting belts.
100 to 168 strokes per minute.
½ H.P., AC, 1,725 R.P.M. motor.
Height from floor to top of vise, 22½ inches.
Weight complete with motor, 580 pounds.
Weight complete crated, 634 pounds.
Floor space, 13x27 inches. Length, 40 inches.

KELLER POWER HACK SAWS are built in several models. All engineered to handle the maximum quantity of stock, within their capacity, at any desired angle of cut, with the greatest possible convenience to the operator.

Write to Dept. A-22 for catalogue, prices and complete specifications.

Sales Service Machine Tool Co.
2363 UNIVERSITY AVE. ST. PAUL 4, MINNESOTA

TEMCO

ELECTRIC FURNACES

MODEL CEA

Model CEA is designed to give outstanding performance at low initial and operating costs. Has special high temperature heating element embedded in four sides of muffle lining for protection and uniform heating. Built with TEMCO stepless control which permits operator to select and hold any temperature from 500° to 2000° F. Maintains even temperature regardless of normal changes in line voltage. Heating chamber 4¾"x4¼"x6". Max. input 1.5 kwh. Insulated cast-aluminum body. Supplied with attachment cord ready to plug in and operate. For 115 V. AC $80.00; 230 V. AC $85.00. *Also available for DC.*

MODEL OFE

Model OFE is built for continuous use up to 1600° F, intermittent to 1900° F. Synchronous motor driven input controller permits selection and holding of any temperature from 250° F to maximum. Highest quality nickel-chromium alloy heating element covers four sides of chamber. Steel frame with 4½" insulation. Counterbalanced door opens upward. Muffle chamber 6"x5"x10". Maximum power consumption 2.2 kwh. For 115 or 230 V. AC $194.00.

Models CEA and OFE are equipped with an indicating pyrometer calibrated in both F. and C. scales. They are economical to operate as nearly all the power is consumed within the heating chamber. Ideal for general laboratory uses, heat treating and small unit production.

See your supply house or write for descriptive bulletins

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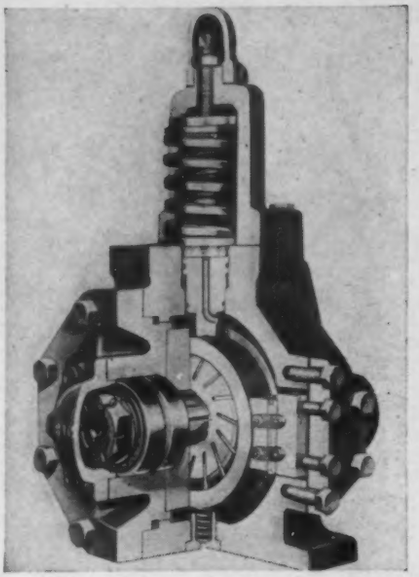
THERMO ELECTRIC MANUFACTURING COMPANY



VARIABLE-VOLUME oil hydraulic pump is available in capacities of 12 to 30 gpm. at pressures to 1000 psi. Made by Racine Tool & Machine Co., 1760 State St., Racine, Wis. It is designed to be engineered into small spaces

Adjustable Roller-Arm Actuator On Micro Switch Die-Cast Switch

The type N2 die-cast enclosed switch with adjustable roller-arm actuator for use in industrial equipment where the switch is exposed to dust, dirt, abrasives and occasional splashing of water and oil is announced by Micro Switch, Freeport, Ill. It is designed especially for cam and slide actuation, and the roller-arm adjusts vertically and horizontally. The switch can be bottom or side mounted.

Weight of the unit is 0.64 lb. Operating force is 6 to 16 oz. Minimum release force is 4 oz., while pretravel is 11/64 in. maximum and overtravel is 7/32 in. minimum.

✔ WIDTH You Want
✔ DEPTH You Want
✔ STROKE You Want
✔ TONNAGE You Want

in any practical combination and without paying for a "special" press

TYPE S
Capacities 60 to 250 tons

In developing this new line of presses, Clearing engineers have not only produced machines of remarkable basic worth, but have made it possible to offer unusual flexibility of specification without serious penalty in the way of cost. Thanks to the welded steel construction—a procedure which Clearing pioneered long ago—dimensional variations in small increments are easily provided. Ingenious planning of the mechanical parts permits wide interchangeability. In short, with the Type S, Clearing is able to build virtually a special press out of stock parts. This means a saving of both time and money for press buyers.

Maximum economy of production in this competitive world can be attained only when the machinery is properly fitted to the task. Here is the way to get presses which exactly match your requirements, giving you top productive efficiency without undue capital investment. We urge you to consult Clearing engineers as to the best way you can apply this opportunity to your own profit. Write for full information.

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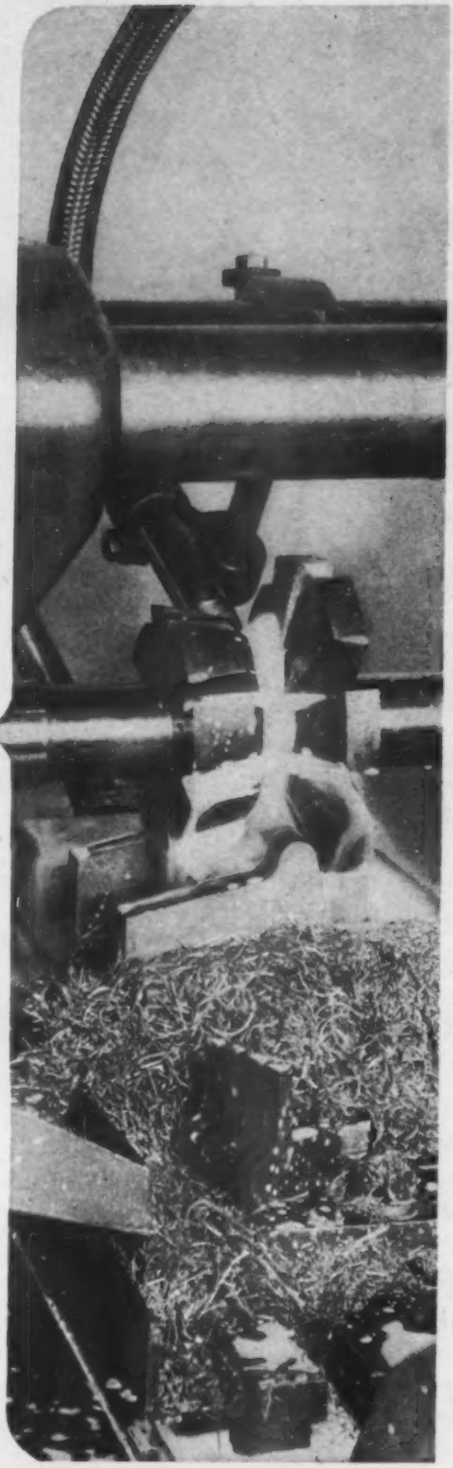

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212 BROWNSTONE AVENUE
PORTLAND, CONNECTICUT

METAL CUTTING OILS METAL CLEANERS
RUST PREVENTIVES

MANUFACTURERS OF RUSTAVOID

ROUND TABLE *Discussion*

CAN TOOLMAKING BE SUBDIVIDED?

Many a man who is a first-class craftsman in other respects is not good in mathematics, even the simpler forms in everyday shop use. This leads (a) to his losing a lot of time on the job trying to figure things out, and (b) a liability to expensive mistakes occuring through his errors.

In spite of the yelpings of the "practical man" who boasts of his ignorance and inability to understand the simpler forms of mathematics, these do enter into everyday toolroom work.

It is a notable fact that the "practical man" of the type referred to frequently complains of his bad luck and the world's failure to reward him on a scale commensurate with his self-assessed outstanding abilities.

If he would see that he is only regarding his own limitations as the standard whereby the value of knowledge is to be judged, he would see the error of his reasoning.

Al is, in my opinion, on the right track, and with reasonable luck has made a sound investment.

K. N. Harris
Harrow, England

•

On drawings of all sorts, not only tool drawings, draftsmen are prone to quote information in drawing-office terms in mathematical form instead of in everyday workshop figures. For example, give angles of tapers, male and female, also of bevel wheels, by all means, and also the essential dimensional figures. The degrees for the spacing of jig holes on pitch circles may be useful, but chordal dimensions are needed in production.

The information is probably accurate, but in the shops dimensional figures are necessary, and, if not provided, the machinist, or Al's mathemechanic, must work them out.

The machinist is a workman and is judged by his capacity, not by his knowledge, or ignorance, of mathematics. Al's mathemechanic seems to provide the complaint and then search for a remedy.

The primary object of the workshop drawing is to give information

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A New STANDARD DUTY PUSH BUTTON

Push Button Station Enclosure with Locking Latch

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⅞" diameter Buttons—"START" Button is black, with guard ring to prevent accidental operation. "STOP" Button is red.

One-piece Bakelite Base—loosening one self-retaining screw releases base.

Loosen one self-retaining screw to remove cover.

Large ⅝" diameter Movable Contacts.

Enclosure furnished in machine tool gray.

Locking Latch on "STOP" Button available.

This Push Button is a worthy addition to the CLARK line of Bulletin 100 Heavy Duty Stations which are available in many types of enclosures.

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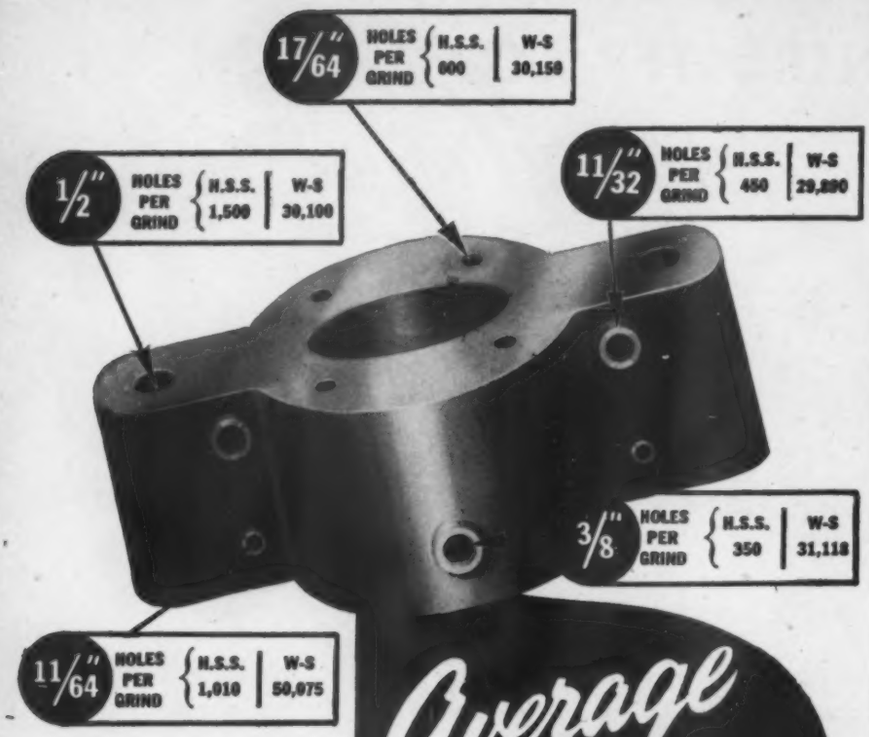
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Records of drill performance kept by a large manufacturer producing cast iron parts, show how W-S Carbide Tipped Twist Drills average 43 times more holes between grinds. Comparisons were made on drilling operations in cast iron. Parts were drilled on multiple-spindle automatic machines. For faster, cleaner lower-cost drilling, try Wendt-Sonis Carbide Tipped Twist Drills in your work. These tools are recommended for drilling plastic and other non-metallic materials as well as non-ferrous metals. Get details in connection with your job requirements.

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BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS
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ROLLER TURNING TOOLS • SPECIAL BITS

as to the form and dimensions of the components to be made so their production will be possible. It would be good if all mechanics were mathematicians, but it would be better if all draftsmen were mechanics, having spent at least one year in the shops between the ages of 19 and 21. With this experinece they would be able to think in workshop terms, should know their requirements, and could foresee their needs, thereby avoiding the provision of "tough" parts. They could not only render Al's mathemechanics unnecessary, but they would save the "figuring" and avoid the loss of production time as well.

J. E. Powell
Lincoln, England

•

WORK THE RULES OR RULE THE WORKS

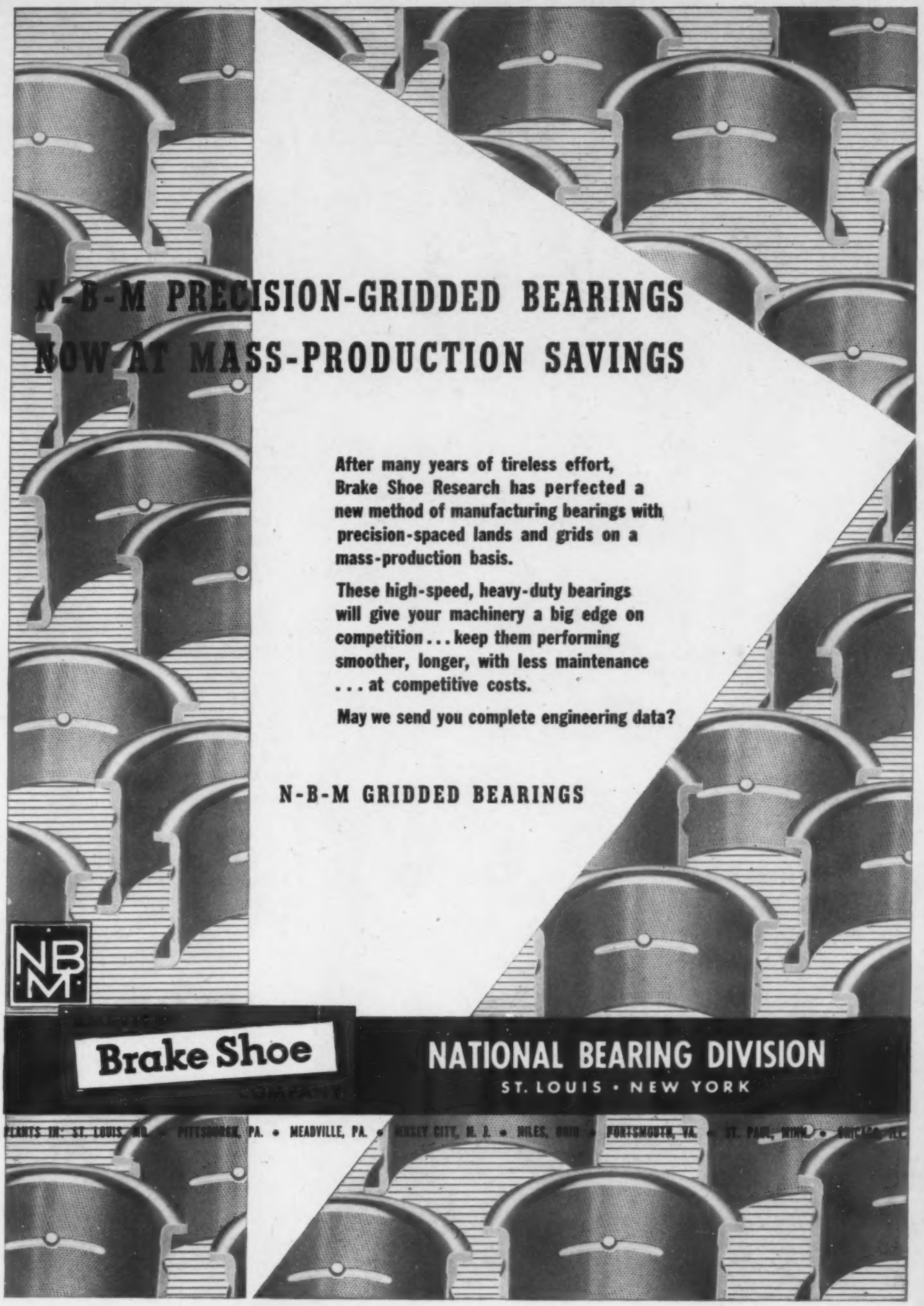
Today with modern rules made by top management and the unions, the easy method of accomplishing the balancing of hours, should a job require a few minutes over the set payroll hours, has gone.

Rules that require men who are to be paid for holidays not worked to be at work for a full day before the holiday and at work on time the day after can present some tough problems to be solved by a foreman.

To follow this rule to the letter would mean that no man, no matter how urgent his reason, can be allowed even a few minutes to catch a train that leaves to take him on a trip over the holiday. Nor would he be allowed to come in even one minute late the day following the holiday, even though the taking of an earlier return train might mean cutting his vacation time short as much as six or eight hours.

Your reaction? It's not fair. Many things in labor laws are not fair to either side. Where can one draw the line? Can the foreman play favorites to a few without causing union trouble today? The answers are not easily found. All cases must be weighed and considered carefully by a competent industrial relations department.

Rules to govern employees grow more rigid as the years go by. Men receive greater pay, but in return they are selling their freedom to the unions who make the rigid dealings with top management. Foremen must carry out the management rules. The foreman must not make his own decisions. He must not permit a man to smoke twenty minutes after the others have enjoyed their smoking period, merely because the worker was completing a



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These high-speed, heavy-duty bearings will give your machinery a big edge on competition . . . keep them performing smoother, longer, with less maintenance . . . at competitive costs.

May we send you complete engineering data?

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rush job. Nor can he ignore the employee who reports a minute or two late several times a week owing to the fact that he lives out of town and the bus he comes to work on is frequently late.

The day of the easy-going foreman is definitely gone. He must abide by the new laws the unions and management have introduced and he must see that each and every man working under him also obeys them.

Charles D. Townsend
Centralia, Mo.

•

PIECEWORK IN THE TOOLROOM

We will all agree that an incentive system of any sort promotes interest. The disadvantages of such incentives in the toolroom are that it promotes super-individualism — the attitude, "I'm going to get mine while the getting is good." Instead of being one of the "gang" working together for the interest of the whole, a worker is going to become a free lance with his own goal blotting out his broader vision.

Where the class of work is such that a man has to be trained to develop a job, where he has to call upon his years of experience to assist him in working things out, I can see no justification for bringing incentive systems into play. There is no incentive system greater than that of a just method of remuneration. The piecework system is not the just method for such work as toolmaking where a man calls upon past experiences to aid him in working out his problems.

John Homewood
Ontario, Calif.

•

Blanket increases, regardless of geographic or economic locale, may have a certain mass appeal and make a good score on the union production line, but it can only lead to an unsound wage policy.

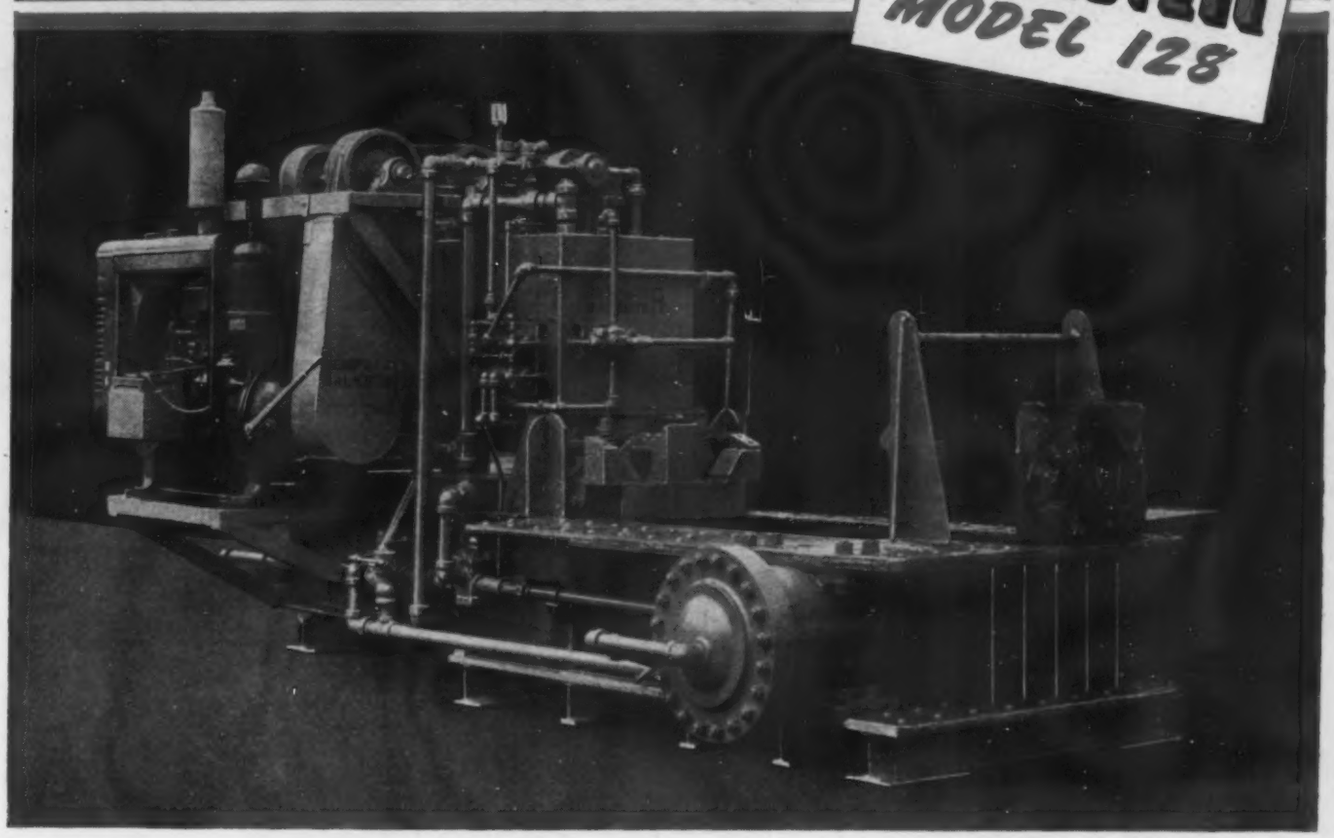
The sagas of the old days must find their modern counterparts to keep alive, and if America is to go on sustaining the inspirational leadership wrought from such stories, equivalent opportunities must be constantly presented.

Properly worked out and correctly operated incentives in the toolroom give the craftsman one of the few chances to retain a vestige of the old rugged individualism.

Men of the old apprenticeship days and a few of the new have an inborn pride in their own accomplishments—a natural consequence of years of learning the basic truths of

FOR HIGH SPEED SCRAP METAL BALING

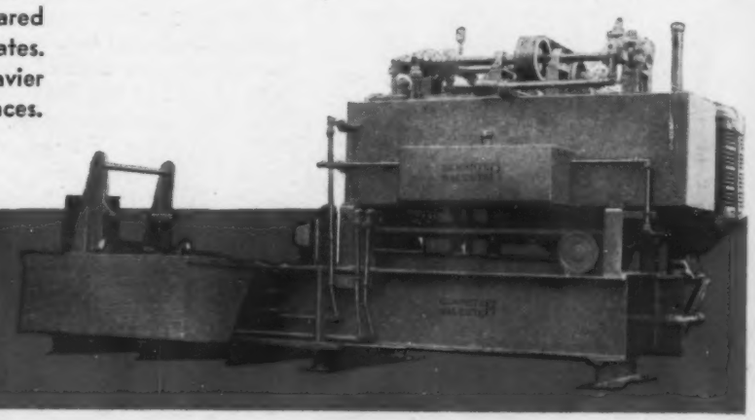
DEMPSTER BALESTER MODEL 128



If you are looking for a portable baling press built to deliver dependable service at high speeds, you'll find it in the new Dempster-Balester Model 128. Featuring two hydraulic pumps, one a double pump, and an extra large oil tank, the Model 128 speeds up hydraulic operations about 50 percent . . . resulting in greatly increased production.

On the Dempster-Balester 128, all points are built oversize to withstand internal stresses beyond the normal need of baling. Charging box is squared and lined with smooth, machined, abrasion plates. Delivers a high density 125 pound and heavier bale that is easily handled from baler to furnaces.

The Dempster-Balester 128 is available with either Electric, Diesel or Gas Motors. This applies also to the Model 125 standard baler and the Model 275, a heavy duty baler that delivers 300 pound bales. One of these is certain to fit your baling requirements. Write or wire today for complete information.



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INCREASED CUTTER LIFE 3 to 4 times with SOLVOL*

... reports

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"Stuart's SOLVOL* was put in on a trial basis for use in Cincinnati Milling Machines on high carbon alloy steel. High speed alloy cutters were used and it was found that SOLVOL* increased the cutter life three to four times of what they had been getting.

"This customer is well pleased with SOLVOL* and will continue to use it in the future on these machines."

Signed E. J. Graham

*SOLVOL

The SUPER Soluble Liquid Cutting Compound

When conventional soluble products fall just short of giving the desired results, and yet conditions of the job seem to call for an emulsion, then the use of Solvol, Stuart's *super* soluble, is indicated. Solvol is more than just a high grade emulsifiable cutting fluid. It is a unique product incorporating extra lubricating qualities which enable it to perform metal cutting jobs beyond the scope of other soluble products. It is a stable, homogeneous compound which mixes readily with water to form an emulsion rich in cutting quality. Q The performance report above is typical, you can't beat the right Stuart oil correctly applied to the job. Let a trained Stuart representative help you to improve production and quality. SOLVOL literature on request.

STUART *service goes with every barrel*

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their craft. It came hard, the way was slow and the wages small. With so little recognition granted those who achieve cum laude, should the Phi Beta Kappa's of our trade schools feel that the opening of the toolroom door spells the end of their crack at honors, rather than a beginning.

Such reasoning generally brings forth from many a management the sophistry, "pride in a job well done is reward enough." But management should need no blueprint to see the profit in a system providing constant tangible recognition.

A. M. Elliott
LeRoy, N. Y.

•

I believe that incentive systems are practically applicable to the skilled trades as well as regular production work. There is no reason why an incentive system should not be successful in the toolroom, if management and labor cooperate to make it so.

There will be no objection on the part of labor to an incentive wage system, if fairness on the part of management and competent rate-setters, working with labor, are assured.

An incentive system indicates to the worker that he is expected to perform up to his capacity while he is on duty in the factory, while older wage systems did not accomplish this objective effectively. It will stimulate interest and put the spirit of competition into the men, arousing work interest to an extent that can be achieved in no other way thus far developed.

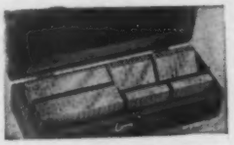
An effective wage system in the toolroom must generously reward the worker for the additional application, increase in output, and quality of workmanship which is required. Unless the reward for increased production is large enough, the worker will not be stimulated to achieve the increased production which is possible under such a wage system. It should be emphasized that cupidity on the part of management is like signing the death warrant of an incentive wage system.

If the reward is large enough, the worker will take new pride in his work—the pride of having earned more money this week than he did last because he worked better and more effectively. The pride of accomplishment in relation to his fellow worker develops. This is logical and justifiable pride and does not result in the setting of a killing pace.

William E. Kaufman
Philadelphia, Pa.

SCHERR aids to precision-production

Save Time on Surface Grinders with SCHERR MAGNE-BLOX



When placed on magnetic chuck, these magnetism-conducting parallels and angle irons will firmly hold small pieces and irregular shaped work. *No need* of special clamps or fixtures. *THEY RETURN THEIR COST* many times over by quicker setups, more accurate results, less danger of distortion and bowing when grinding thin flat work. Made in many different sizes and shapes. Ask for catalog. *DON'T REGRIND YOUR MAGNETIC CHUCKS—BE WISE—USE MAGNE-BLOX—Special offer:* Set consisting of 2 parallels 1 x 1¾ x 3¾ plus 2 V-blocks, hard brass and Swedish iron laminations in solid metal case $17.50. Money back if you can duplicate this value.

SCHERR CUTTING TOOL GRINDING FIXTURE

FOR SURFACE GRINDER. Grinds both cutting angle and clearance in one setting. The unique patented feature is a tilting block which if tipped, gives 3, 5, 7, or 10 degrees clearance to the tool, just the right cutting angle to suit the material to be machined. This simple inexpensive tool does the work of special machines. Clamp the tool to the ground in the Scherr Fixture, set to angle desired and tilt the block to proper clearance. Special introductory price $27.50, FOB New York, with Scherr money back guarantee.

THE LITTLE WONDER RADIUS DRESSER

Dresses wheels on surface grinders or cylindrical grinders to any desired radius up to 1", concave or convex. The swinging arm, the only moving part of this ingenious simple device, is pivoted on two lapped centers which never freeze or clog. Supported on both ends with no overhang or slides, there can be *no vibration of the diamond*. Result: absolutely smooth and accurate radii on the wheel. The Diamond tool is set by means of Micrometers, Depth Gages or gage blocks. Price complete with 1/3 carat diamond $46.00—$39.00 without.

GAGE BLOCK UTILITY SET

Quick adjustable type holders. Greatly expands the usefulness of any set of standard gage blocks. The complete set includes four holders—2", 4", 8" and 12", two jaws each for inside and outside measurements, a 60 deg. center point, a scriber point, and a substantial height gage base. Holders have no long projecting screws to make handling awkward. Every shop can profitably use one or more of these economically-priced sets, which will save their cost many times over by applying gage block accuracy at first hand, allowing for no variation through the use of any other tool. Any parts of this set can be furnished separately at moderate cost.

Write for full details on the above tools, and for the Scherr Small Tool Catalog.

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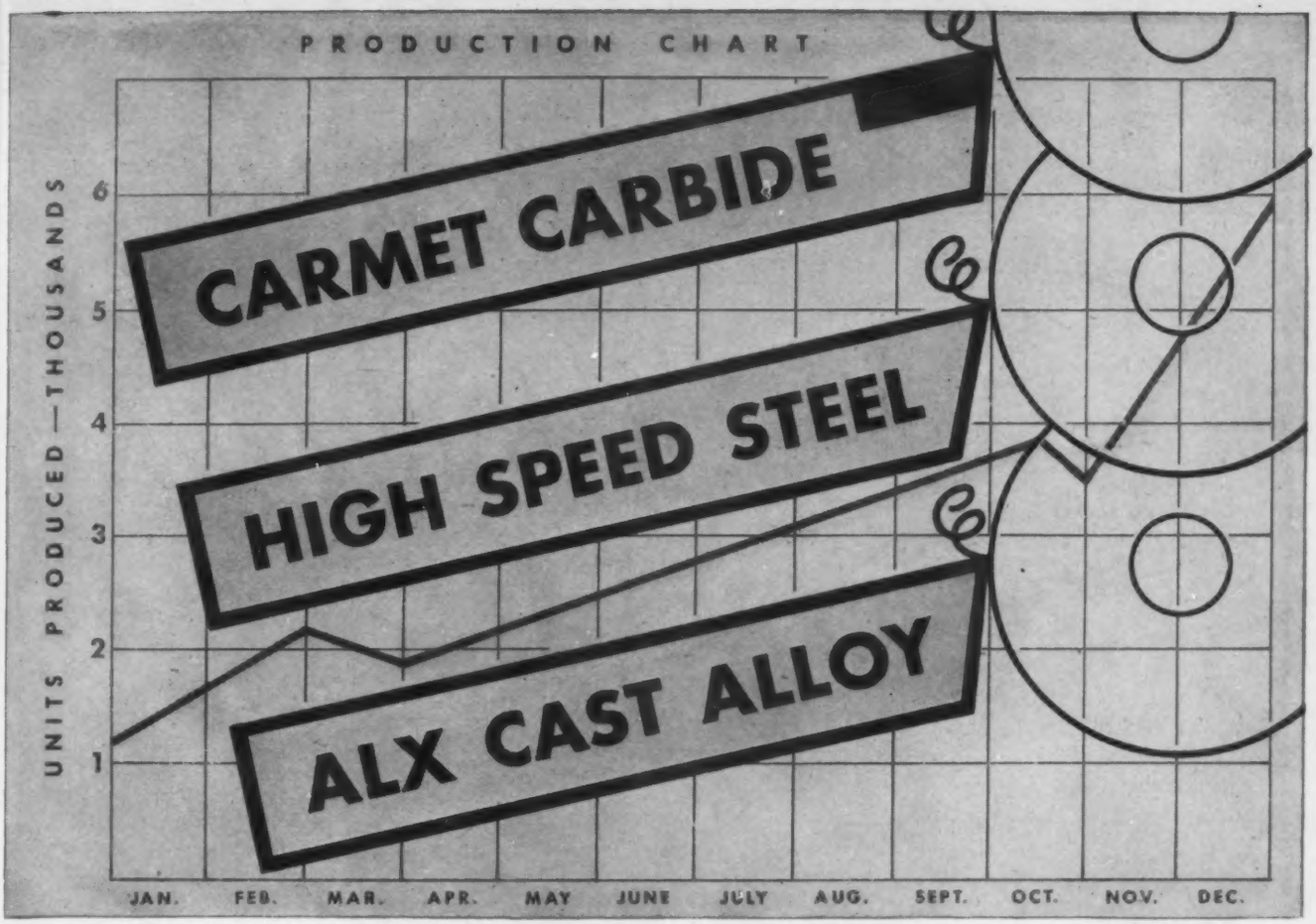

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Allegheny Ludlum offers you—*from one source*—a choice of *every* type of cutting material . . . each in a wide and complete range of grades and sizes. That means a better opportunity for you to pick the tools *best* suited to each of your production jobs—with resultant savings in production time and costs. There's real value for you in one source for all your cutting tool requirements, plus a competent Mill Service Staff to assist your selection. • Write today—on your company letterhead, please—for our new, full-color booklet on "Cutting Tool Materials." You'll find it a big help in your production plans.

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THE CLARK FORK TRUCK lifts, carries, tiers *anything* in cartons, barrels, bags, crates, drums . . .

YOU CAN REDUCE demurrage, accidents and damage losses. By tiering units to ceiling heights you can multiply your storage space . . .

FROM RECEIVING TO SHIPPING, movement of materials can be accomplished more efficiently and economically . . .

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Convention Hall — January 12 through 16

You can count on Clark Tructractor to "steal the show" as it did in '47 with sound, practical, new ideas for cutting handling costs. Both gas-powered and battery-powered fork-lift trucks and towing tractors, together with attachments—products of Clark's traditional quality, versatility and leadership.

CLARK EQUIPMENT COMPANY
TRUCTRACTOR DIVISION
BATTLE CREEK, MICHIGAN

CLARK GAS OR ELECTRIC POWERED FORK TRUCKS
AND INDUSTRIAL TOWING TRACTORS

VACATION—A LOAF OR A LEAVE?

Thompson was not just to his employer or himself by taking a job on his vacation similar to his regular routine. No wonder he returned to his job tired and disgruntled, instead of refreshed and ready to go full steam ahead.

If Thompson was interested in seeing how other companies handle similar work there are trade and technical magazines containing the information. A number specialize on latest methods and developments in shop practices—ideas he no doubt could use.

It is the business of the employer to keep his employees physically fit, because an alert, satisfied worker is good for the morals of any shop or office.

A worker owes it to his family to take a vacation with them, relax, learn to play, and do some of the things he doesn't have time to do at any other time.

A vacation well spent, not necessarily expensively spent, can make a world of difference to taut nerves and a grumpy disposition. It can broaden the horizon and change the outlook on life to a remarkable degree.

A. Tomlinson
Philadelphia, Pa.

•

Many years ago the only employees who were given one or two weeks' vacation with pay were top executives and general office help who were on straight salaries.

In general, paid vacations were given in recognition of loyalty plus overtime without pay. Later foremen were also given vacations with pay if they were on a salary basis. In more recent years, the majority of plants instituted vacation systems allowing one or two weeks to employees, depending upon length of service.

One of the greatest arguments for paid vacations has been the fact that when vacation time came around the majority of employees did not have the necessary funds to take themselves and their families on a vacation.

In the case of Thompson who got himself a job at another concern in Detroit when he was supposed to be on vacation, unless there was an urgent need for extra money due to sickness in the family, his course of action was all wrong. No wonder he came back to work a nervous wreck.

A man, in my judgment, is honor bound to both his employer and

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CYCLONE
MODEL M
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Entirely new...completely different...35 pounds of overhead materials handling efficiency... unlike anything heretofore seen or experienced in chain hoists.
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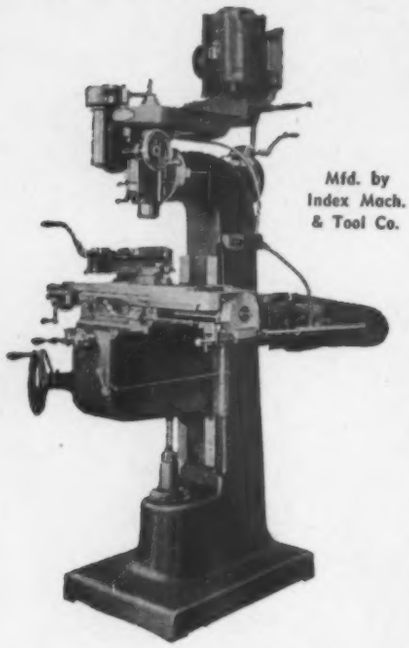
See us in Cleveland at Booth 526 . . . Materials Handling Exposition January 12-16.

INDEX MILLS

will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



Mfd. by Index Mach. & Tool Co.

12" Tool Room Rotary Table

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

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JACKSON, MICH.

union, if he is a member, to spend his vacation in a way that will give him the greatest benefit.

If the majority of workers adopted the Thompson method, all the good work of employee and union officials in making the vacation with pay possible would be totally wasted.

Arthur Silvester
Niantic, Conn.

•

Ed, it seemed to me, is on the wrong side of the fence. He seems to believe that because Thompson was granted a vacation, he is not accountable for the way in which he chooses to spend his time.

In a technical sense, the time of a man's vacation belongs to himself, to do with as he will; but it is the purpose of the vacation which we must consider.

Ed's argument that vacation time is only a chance to earn extra income is not valid.

It is true, of course, that staying within one's budget may be difficult in periods of high prices; but sacrificing a vacation for this motive is not to be commended. Rather is it to be condemned, for working on vacation has an adverse effect on the worker's health, even though a change of scenery takes place.

Moreover, changing environment while still engaging in the same type of work is not relaxation, which is the primary reason for a vacation.

A change of routine is the requirement, embodying not only environment, but also activity. The man who takes a real vacation returns revitalized, with a zest to engage in his work, and the ability to keep his production up to par, which is what his employer is paying for.

Milton E. Sussman
Dunellen, N. J.

•

For years, groups of laboring men who toil daily have been bettering their working conditions and employers have mostly cooperated.

The subject of paid vacations for shop men is comparatively new in the annals of employment. But to leave a regular place of employment and to seek a temporary job in another shop is not a vacation.

The employer is best served by a man using his vacation time for the purpose for which it is granted, the wages received from the company during this period providing a complete change of thought and environment.

In these days when men live in uncertainty, doubt, and under the stress of high prices, it is more than ever necessary to have periods of time during which freedom from prejudices and intolerances is enjoyed.

In the last analysis, the mind and body need time to perform their functions of repair and reconditioning after a year of steady, strenuous routine work; hence, it is wrong for a man to do work for others at such a time. The small stipend received will not be worth the loss of a complete change and relaxation a proper vacation gives.

F. H. Stebbins
Worcester, New York

•

FRIEND OR FOREMAN?

There is nothing wrong in Al going on a fishing trip with Bill Cline. Al is Bill's superior, or supervisor, while on duty only. At all other times the two friends are men who chance to be paid by the same employer. Ed's being fearful of what "they," meaning self-appointed judges of shop affairs, may say or think is "borrowing trouble." Ed is like a young man who on the day that school opened in a one-room building at the cross roads, informed his pupils that he fully realized that "the eyes of the world were upon him as he assumed the responsibilities of his position." Ed takes himself and his job too seriously.

Charges of favoritism, be they true or false, may arise at any time against anyone who is in charge of the work of others. It is the business of the foreman to see that such charges are in all cases untrue.

Where is there a man better qualified and situated to cultivate good will between man and management than the foreman? He meets and speaks with each employee of his may exert a more powerful influence department daily and, in my opinion, in harmonious relations than can be obtained from some remote office.

In a shop, as in a home, the head may be firm and at the same time kind. He may, if he makes the effort, pause to congratulate Pete whose son has finished school, or to ask Joe about the sick wife or child. Off duty he should fish with Bill, attend the ball game with Jake, or, if he has time for all this recreation, play golf with Tom. In other words, and avoiding any patronizing attitude, make friends with all of the gang. In the shop, be the boss, and make it stick.

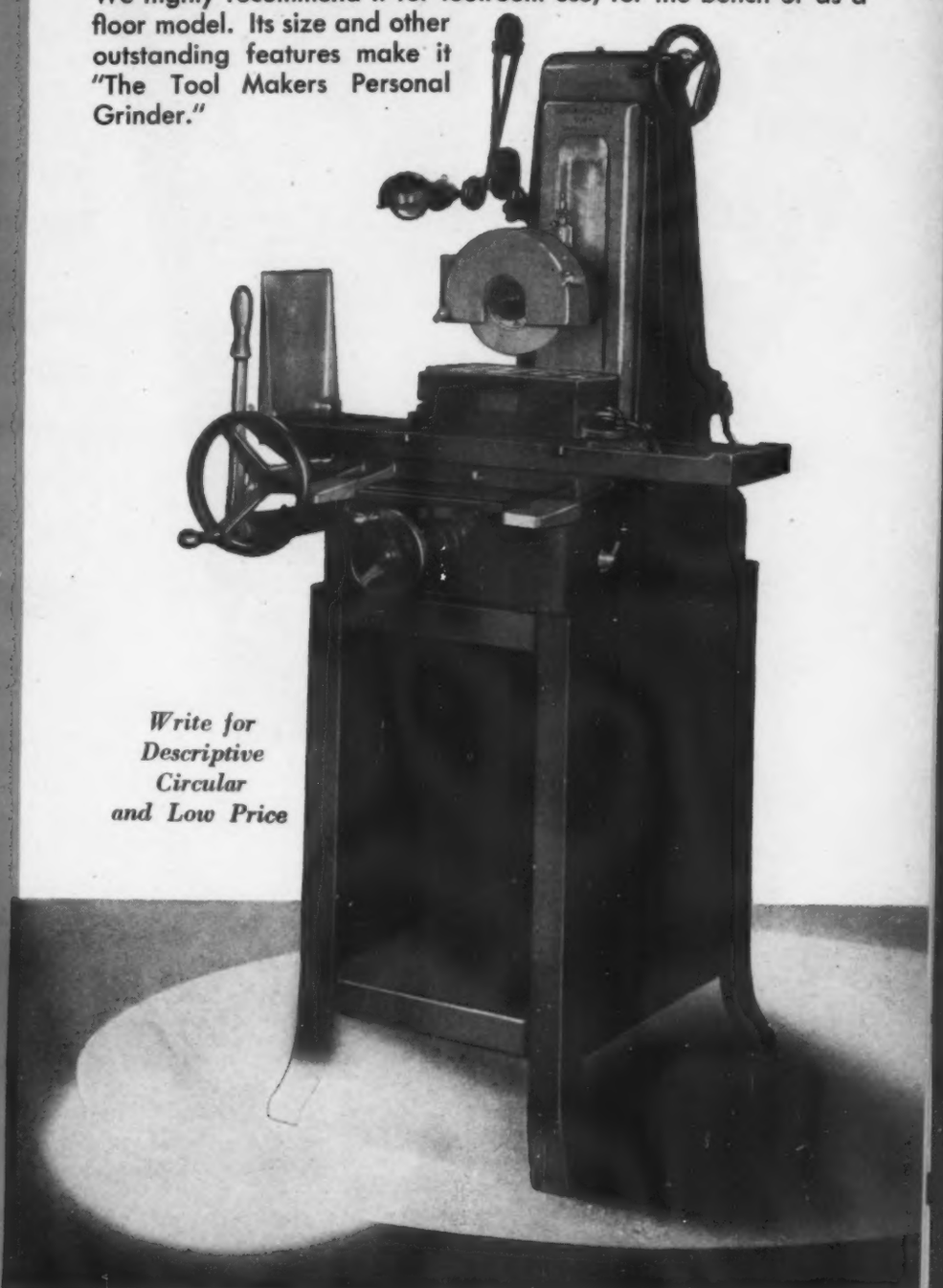
Friend or Foreman? Both!

F. M. A'Hearn
Greenville, Pa.

ANNOUNCING

A *New* BOYAR-SCHULTZ SURFACE GRINDER For BENCH or FLOOR USE

Designed to supply the need for an accurate, easy operating, sturdy Surface Grinder capable of performing with full precision on smaller work . . . Tools, Dies, Gauges, Fixtures. This new Boyar-Schultz machine will grind to close tolerances. It is sturdy and has long-wearing qualities found in larger surface grinders. We highly recommend it for toolroom use, for the bench or as a floor model. Its size and other outstanding features make it "The Tool Makers Personal Grinder."



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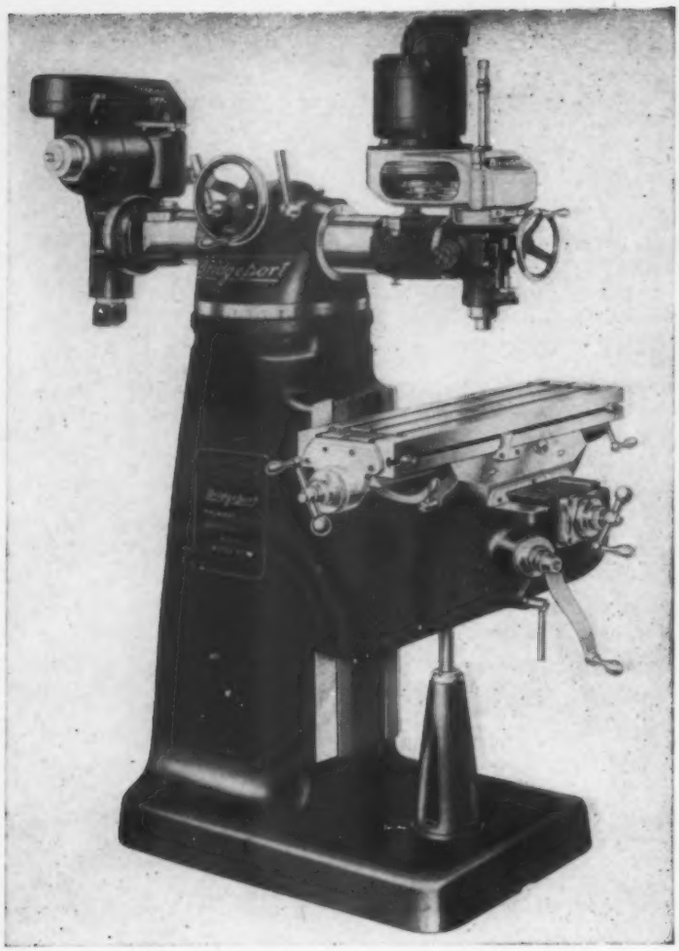
Bridgeport

TURRET MILLING MACHINE



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The "BRIDGEPORT" can be kept busy, save time, and conserve manpower on milling, drilling and shaping, at all angles of the work with a single set up. It is a modern, proved machine of outstanding versatility—one that can be depended on to effect such savings in production costs as to assure a high return on the investment. Yet in spite of its speed, productivity and accuracy, the "BRIDGEPORT" is moderate in first cost.

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Specifications: Longitudinal Feed—20" with standard table. Cross Feed—9". Vertical Feed of Knee—16". Standard Table—9" x 32". Special Tables 36", 42" and 48" available; also longitudinal power feed. Weight with Shaping Unit—2000 lbs.

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Bridgeport, Connecticut

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FROM "snagging" in the cleaning room to light finishing on forgings, dies, etc., you will find the *right* model for *every* job in the extensive line of Cleco Rotary Grinders. These grinders feature rugged alloy steel rotors, heat treated and ground to exact size — insuring vibration free operation at all speeds. Governors efficiently control the speed, whether idling or under varying loads, providing ample power at all times plus utmost economy in air consumption. Highest grade ball bearings are used throughout. An efficient lubrication system helps increase the life of the tools. Bulletin 80 describes Cleco Grinders in detail and includes a large blueprint of construction details. *Ask for it!*

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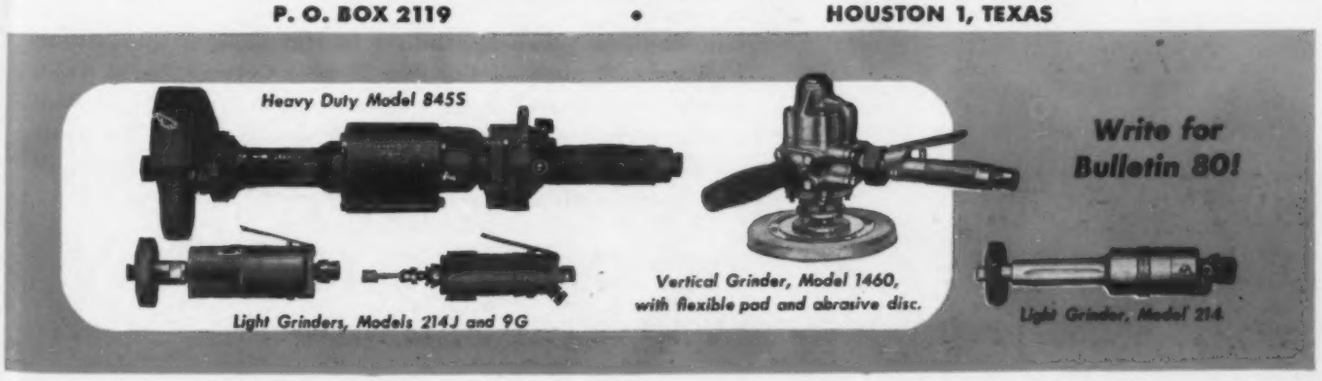
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JUST this—they prove that aluminum, in case after case, costs less than the materials you are now using when all its advantages are known and capitalized on fully.

"Too costly," said sheet metal contractors when first approached by Reynolds on fabricating ducts from aluminum sheet. But they discovered that pound for pound aluminum offered *three times* the working area of galvanized sheet steel. That its light weight made for important fabrication and erection economies. So, today, with steel prices up and aluminum at an all-time low, the final cost of this premium material is actually lower—and they're getting immediate deliveries. What's more, the customer (a good man to remember these days) is receiving, at no extra cost, rustproof duct work that will last a lifetime.

Yes, there are many factors that go to make up the true cost of aluminum. Failure to consider them all may be costing you the benefits of this modern metal. Reynolds technicians will welcome the opportunity to work with you in the use of aluminum for the betterment of your products and profits. For complete information contact your local Reynolds Sales Office or write Reynolds Metals Company, 2523 S. Third Street, Louisville 1, Kentucky.

The price of aluminum has gone down 30% since Reynolds became a primary producer in 1939.

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PLUS strength, PLUS safety factors, PLUS capacity has always been characteristic of FERRACUTE since the days of our Founder, Oberlin Smith. Frankly, we sometimes wonder whether, in these modern days of doing only the least necessary, we have been foolish in sticking to the tradition. But FERRACUTE PLUS VALUES have paid off for our customers through 84 years in long wear, low maintenance, splendid safety records, all-round economy, efficiency and versatility.

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+ Ferracute low-maintenance clutch.
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For cutting, punching, stamping, shallow drawing and forming. Inclinable models from 5 to 150 tons. Immediate shipment on some sizes. Very prompt deliveries on all. Write for full specifications and information.

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AN ANNOUNCEMENT of IMPORTANCE TO BUYERS of CUTTING OILS—

Houghton presents 4 new series of

CUT-MAX OILS

Highly fortified

Light in color

Easy to select

Culminating a year's development work in evaluating and simplifying a lengthy list of cutting oils, Houghton now introduces four new series described below—covering the full range of requirements for straight cutting oils. A new folder giving further details is ready for your request.

CUT-MAX 100 SERIES

High in saponifiable fatty oil content. Contains no sulphur or extreme-pressure additive. Primarily intended for use in machining non-ferrous metals, or for machine tools having bearings of brass or bronze.

CUT-MAX 200 SERIES

This is the heavy-duty group—fortified by added active sulphur (not merely the natural sulphur content of the oil itself) and by an extreme-pressure additive well blended into the cutting fluid. Included in this series are five oils identical in properties and varying only in viscosity, so that blends may be made to suit the needed fluidity without altering additive balance.

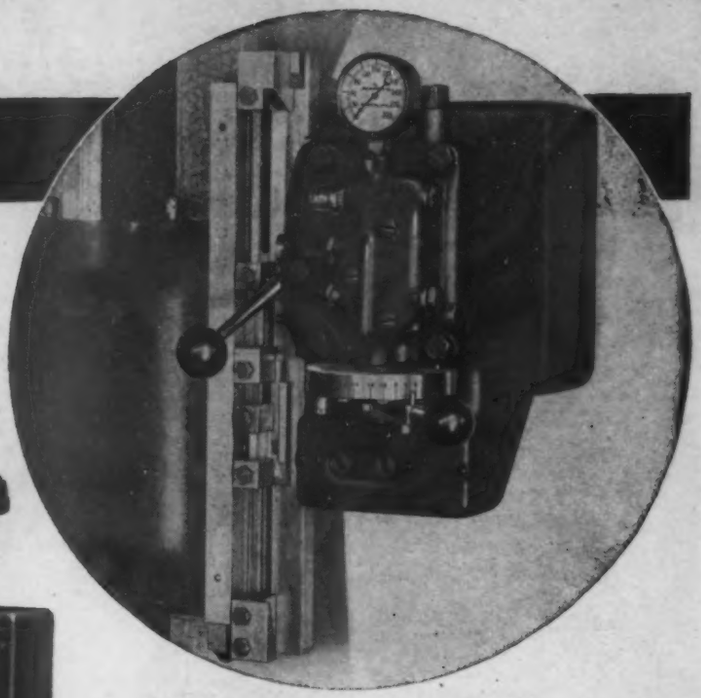
CUT-MAX 300 SERIES

This series fills a need for cutting fluids high in saponifiable, specially sulphurized content, but free from chlorine so that bright machined surfaces will not stain or dull. A variety of viscosities is provided.

CUT-MAX 400 SERIES

A complete new development—light-colored, clear oils mildly but effectively treated to reinforce nature's best petroleum stocks, and to offer an excellent money value for cost-conscious buyers. Whereas light-colored oils in the past have tended to lower cutting efficiency, the Cut-Max 400 Series include added sulphur (active—not inert) and E. P. additive, yet retain the clear appearance desired by many operators of automatics.

E. F. HOUGHTON & CO. PHILADELPHIA AND ALL PRINCIPAL CITIES



THE LELAND-GIFFORD No. 4 HYDRAULIC DRILLING MACHINE . . . . . .

A RUGGED GIANT *For Speedy Drilling*

Features

Feed Control- By displacing oil on back pressure side of piston.

Rapid Approach and return at rate of 240" per minute with cutting feeds from ½ to 20" per minute.

Ability to Jump Gaps.

Spot Facing by feeding against an adjustable positive stop, thus maintaining extreme accuracy.

Overload Pressure Release prevents injury to drill or work.

Step by Step Drilling For deep holes.

Send for Bulletin No. 800

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When war came . . . THIS PLANT WAS 10 MONTHS OLD!

Looking back now over its first 75 years of pioneering in the threading tool field, there is no greater satisfaction to the men of GTD "Greenfield" than the fact that its gage "war plant" was already 10 months in production when the Japs struck at Pearl Harbor.

GTD "Greenfield" is proud of this achievement, because it was the outgrowth of years of cooperation with the army's long range procurement program. Since the ending of World War I GTD "Greenfield" and many of its key personnel have been closely identified with the Industrial Mobilization Program and the "Defense Program" which went into high gear early in World War II. Hence, our gage plant was not so much an overnight "war plant" as it was the natural culmination of an integrated program.

With a record of five "E" awards behind it, this "war plant" is now a "peace plant", utilizing the organization and the new techniques developed during the past six years to meet an unprecedented peacetime demand for gages.

GTD Greenfield 75th YEAR

A recent development in the manufacture of gages has been GTD "Greenfield's" introduction of formed clearance in the major diameter of ring thread gages. Before this development, root clearance was ignored, but under the more scientific manufacturing procedures guess work is eliminated and formed or controlled clearance has resulted in a greatly increased wear life on ring thread gages.

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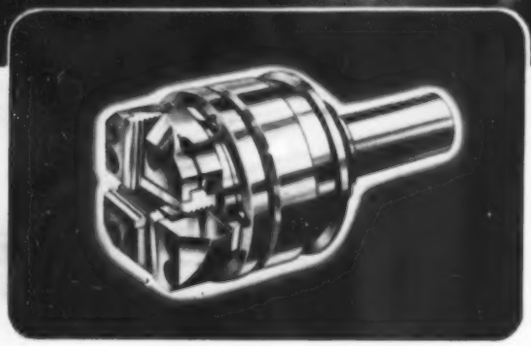
The GEOMETRIC TOOL COMPANY
New Haven, Connecticut - In Its Fifty-Fourth Year

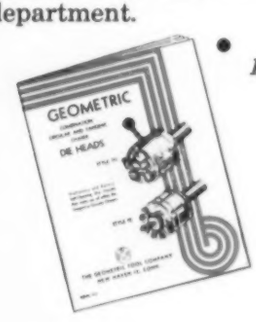


GEOMETRIC STYLE TR ROTARY SELF-OPENING DIE HEAD fitted with "Tangemetric" (Tangent) Chasers, used for cutting external threads. Available in 3 sizes with an overall capacity of ⅛" to 1½".

Backing GEOMETRIC Threading Tools . . .

In Geometric's busy Inspection Department experienced inspectors put Geometric threading tools through rigid mechanical, optical and cutting tests . . . . checked by the most accurate equipment available. Geometric's customers may be sure that any failure of Geometric tools and chasers to conform with close tolerances and high standards, no matter how slight, is quickly detected by the vigilance of the skilled workers in this department.

Geometric inspectors' knowledge of the job and their attention to every detail are typical of the care which goes into every Geometric threading tool and chaser. Geometric customers are guaranteed the finest precision threading tools that money can buy.



If you would like to learn more about Geometric Combination Circular and Tangent Chaser Die Heads, write today for FREE 12-page bulletin #T-3 which describes these tools in detail. This bulletin is illustrated and lists complete TH and TR Die Head specifications.

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AND BETTER...

THE MORE..
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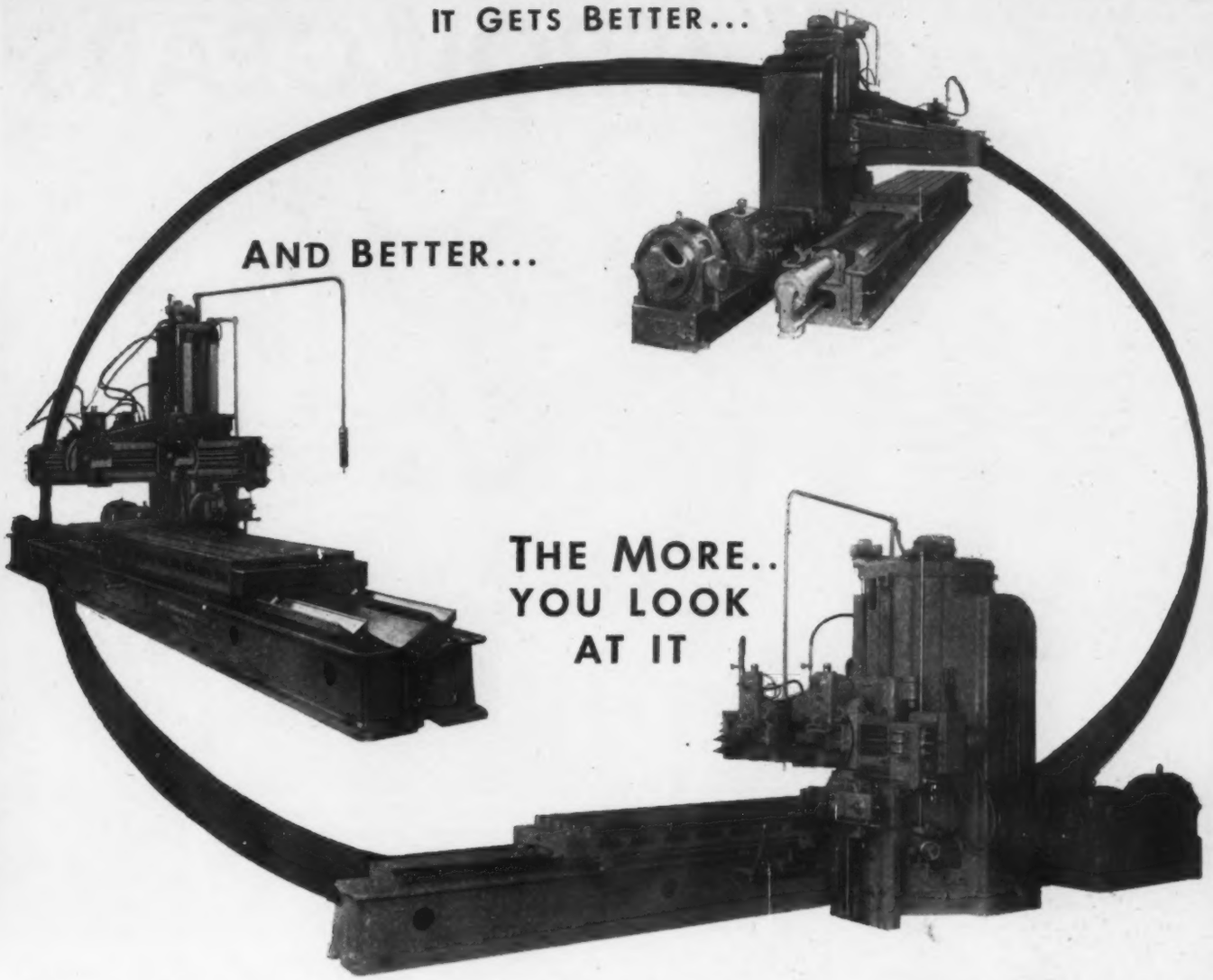

The *New* ROCKFORD *Hy-Draulic* OPENSIDE PLANER

WRITE FOR THE FACTS

Ask for Catalog 450. Gives the complete story of the Rockford Hy-Draulic Openside Planer . . . built in four sizes, each in a selection of six stroke lengths from 10 to 20 feet.

Inspect the Hy-Draulic Openside Planer critically. When you do you'll be convinced that only Hy-Draulic design can give you all the advantages you want in a new planer. For example, levers in duplicate on either side of the bed plus the overhead movable pendant give full control of table travel and power rapid traverses. All adjustments are easily made; table cutting and return stroke speeds are set at the hydraulic pump . . . selection of speeds is infinite within a wide range . . . direction of power rapid traverses and feeds are selected by levers located at the column-end of the crossrail . . . Hy-Draulic Feed is set by simple handwheel adjustment. For proof of extreme rigidity, check the massive column ot the Rockford Openside Planer. Every type of work and material may be cut without reducing accuracy. For complete details consult your nearest Rockford Hy-Draulic representative.

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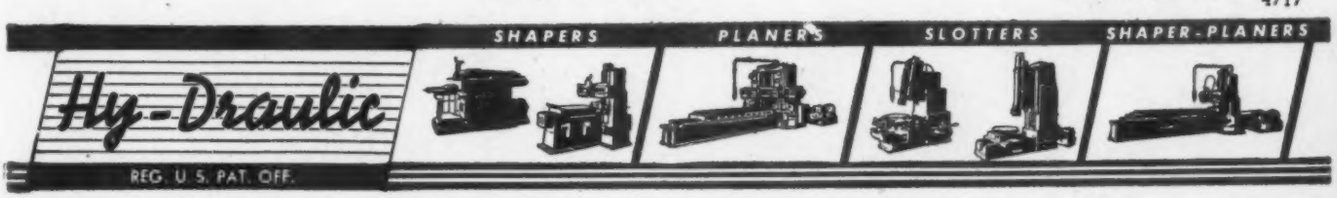
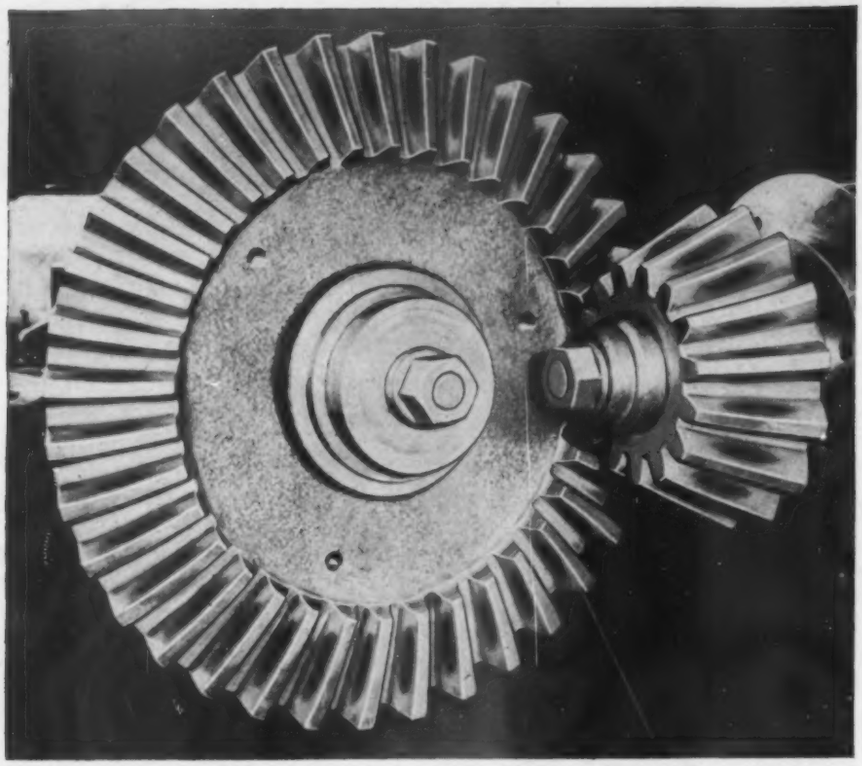


And now - "ZEROL" GEARS



Testing a large pair of Zerol gears, 15 x 36 combination, 1 D.P. These gears were cut on a Gleason Planing Generator for large spiral bevel gears. Although the teeth appear to be almost straight, they are actually slightly curved from end to end. The difference in curvature between the gear and pinion teeth controls the length of tooth contact.

. . . by PHILLIE-GEAR . . . up to 48" diameter

Zerol gears are curved-tooth bevel gears with zero-degree spiral angle. *They combine the localized tooth contact of spiral bevel gears with the low thrust loads of straight bevel gears.*

Localized tooth contact results in smoothness, quietness and strength, even under extremely high loads. For these reasons Zerol gears are replacing straight bevel gears in many applications where thrust limitations prevent the use of spiral bevel gears.

Like straight bevel gears, Zerol gears have the advantage of no inward axial thrust under any conditions. In fact, with zero-degree spiral angle, the thrust loads are the same as for equivalent straight bevel gears, with the result that Zerol gears can be substituted for straight bevel gears, without change in thrust bearings.

Zerol gears, like other bevel gears, are designed with long and short addendum tooth proportions for smooth, quiet operation, and with large fillet radii for maximum strength.

Large Zerol bevel gears, when required, have their teeth (only) hardened on our own surface hardening machine, while smaller ones, where necessary, are hardened by the induction, straight heat treating or case hardening methods.

These gears give localized tooth bearing, which decreases stress, greatly lengthens gear life, and minimizes breakage.

We are in a position to cut gears of the Zerol bevel type up to 48" in diameter. Write us for further information.

"Over 55 Years Gear Making Experience"

Philadelphia

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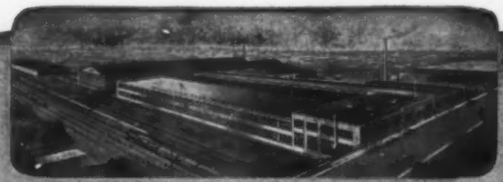
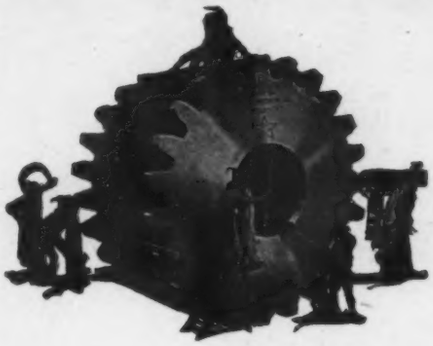


Industrial Gears and Speed Reducers
LimiTorque Valve Controls



GANSCHOW

CUT GEARS ALL TYPES

MEMBER AGMA

Better Gear Products

GANSCHOW GEAR CO., 14 N. Morgan Street, CHICAGO 7.

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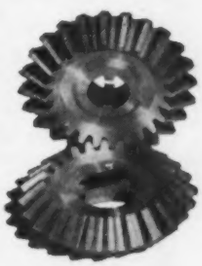
GEARS For INDUSTRY

SINCE 1888 . . . We have been making many types and sizes of gears for industry. Vast plant facilities of the most modern gear cutting equipment assure capable handling of your *production* or *special* gear requirements.



HELICAL and BEVEL GEARS—From 1" to 60" in diameter and from 24 DP to 1½ DP.
SPUR GEARS—Size range from ¾" to 150" in diameter. 32 DP to ¾ DP.
HERRINGBONE GEARS—Made from 1" to 60" in diameter and from 10 DP to 1½ DP.
SPIRAL BEVEL GEARS—Made from 1" to 30" in diam. and 24 DP to 1½ DP.
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YOUR GEAR INQUIRIES WILL RECEIVE IMMEDIATE ATTENTION

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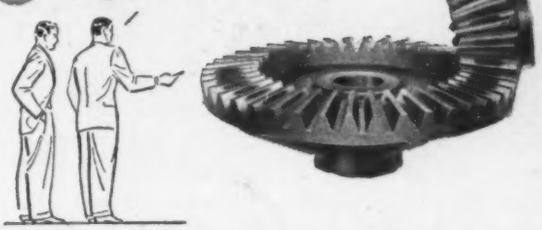
CINCINNATI "Coniflex"

THE BEVEL GEAR with . . . LOCALIZED TOOTH BEARING



Cincinnati Coniflex gears make possible wider operating tolerance . . . allowing slight deflections in operation without dangerous concentration of the load at the ends of the teeth.

For smoother, quieter operation . . . localization of tooth contact in Cincinnati Coniflex Gears assures a good tooth bearing under operating loads.

For faster . . . easier assemblies look to Cincinnati Coniflex Gears

THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
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GEARS • CAMS
THREAD GRINDING
. . . TO YOUR SPECIFICATIONS

When you come to "HARTFORD" you get what you order—without delay—at reasonable cost.

Send specifications—ask for quotations.

THE HARTFORD SPECIAL MACHINERY COMPANY
HARTFORD, CONN.

Sier-Bath Precision Gears

enable you to DESIGN A MORE COMPACT MACHINE

● Machine Designers know that if you reduce the T.A.E. (Total Accumulated Error) in gear manufacture, you can also reduce the size of the gear, and make a more compact machine. Sier-Bath Precision methods cut down T.A.E. to the practical minimum. This enables Sier-Bath Gear trains to support heavier loads and faster speeds than regular commercial gears. Sier-Bath uses such up-to-the-minute machines as the Red Ring Shaver, the Sykes Generator, the J. & L. Thread Grinder. Sier-Bath eliminates manual, visual and thermal checking errors by using mechanical recording checkers in an air-conditioned, constant temperature checking room. Distortion is reduced to a minimum by constant temperature quenching baths, controlled atmosphere furnaces, quench presses, flame hardeners. Let us quote on your job.

GEAR RANGE:

● Spur, helical and worm gears to 48" Dia. 3 D.P. and finer; straight tooth bevel gears 32 pitch to 3 pitch, up to 23" P.D. depending on ratio. Gears shaved from 1" to 24". Continuous Tooth Herringbone Gears generated by Sykes Method up to 37" O.D. Worms and threads precision ground on J. & L. Thread Grinder to extremely close tolerances. Spur gear grinding up to 16" diameter. Helical gear grinding up to 10" diameter. Involute and straight side splines up to 42" between centers.

ALSO MAKERS OF SIER-BATH SCREW AND GEAREX ROTARY PUMPS

FOUNDED 1905 MEMBER A.G.M.A.

Sier-Bath GEAR and PUMP CO., Inc.

9246 HUDSON BOULEVARD NORTH BERGEN, NEW JERSEY

YOUR REQUIREMENTS
assured by
Our 69-Year Experience

"Grant" for quotation and de- supplying gears is at your service. Whether you require a single "special" or stock gears in quantity, it will be to your advantage to submit your requirements to Grant "know-how" in making and livery date. We are in position to render prompt service.

GRANT GEAR WORKS
BOSTON, MASS.

GEARS
SPURS, SPROCKETS SPIRALS, BEVELS

Short or production runs guaranteed workmanship reasonable prices

THE PRECISION GEAR CO.
743 Main Street, Walpole, Massachusetts

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

SPECIALISTS... not jacks of all trades!

To do one thing *perfectly* rather than many things well is the sole objective of every MEISEL gear. And being constructed with only the requirements of a specific job in mind, MEISEL gears function at maximum efficiency always. Whatever your gear problem, investigate the advantages of *specifically* engineered gears by MEISEL.

MEISEL PRESS MFG. CO.
946 Dorchester Avenue Boston, Mass.

the Forgesmithing factor in "OK" steel forgings

● Mighty as is the power of the forging press, the long acquired skill of the forgesmith is a most vital factor. To produce correct grain flow without impact damage to the structure of the steel is a matter of personal skill. The metal is formed by a powerful squeeze which penetrates throughout the ingot. The proper application of this squeeze to produce a forging of uniform structure is skill from experience.

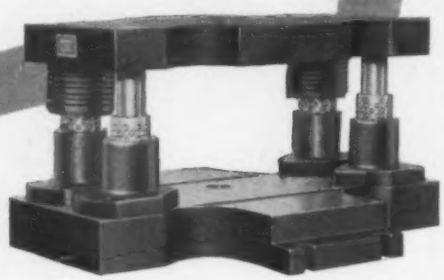
National Forge standards call for careful pre-heating ("soaking") to the prescribed forging temperature, completion of the forgesmithing before the ingot cools below safe working heat and careful temperature control after forging to prevent cooling strains impairing the strength of the steel. As National Forge makes its own basic electric steel, it has the advantage of working with steel that is specifically made for each forging under strict metallurgical control.

Let us give you the latest facts and data applying to the type of steel forgings required in your plant or product.

National Forge
AND ORDNANCE COMPANY
Irvine, Warren County, Pennsylvania

STRETCH DIE LIFE

WITH LEMPCO PRECISION ANTI-FRICTION DIE SETS



Licensed under inventions of Guy Connor

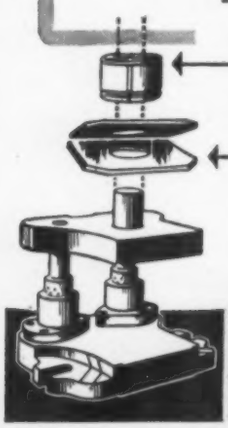
Cash in on all the production built into your dies; stretch die life by mounting them in Lempco Anti-Friction Die Sets.

These precision sets guarantee perfect alignment of punches and dies. Pre-loaded anti-friction bearings between leader pins and bushings never allow the slightest play; they prevent any lateral motion or tilting of the punch holder, so that punch and die engage squarely every time. Clearance between cut edges is maintained. Chipping of edges is eliminated. You obtain more production per grind and longer die life.

They open and close easily, too—end the danger of accidental damage caused by pry bars, jacks and hammers. And, they offer positive, simplified lubrication.

Lempco Anti-Friction Die Sets can be made in any shape or style. Take a minute NOW to learn more about them. Just drop us a card. You'll have your fully-illustrated catalog by return mail.

EXTRA PROTECTION FOR DIES



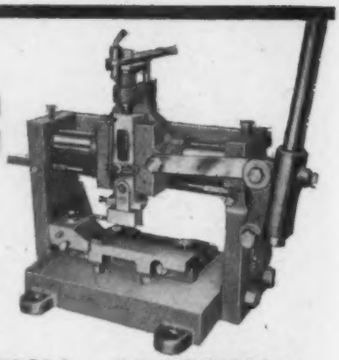
BALL JOINT SHANKS
eliminate perpendicular misalignment between shank clamp bushing and die set.

BALL ACTION DI-ALI-NERS
automatically correct punch press misalignment, front to back, left to right, or diagonal. Matched spherical plates, machined and cadmium plated for long life.

LEMPCO

5711 DUNHAM ROAD • BEDFORD, OHIO

for **ACCURATE** METAL MARKING *the* **FORCE**



E.P.1 MARKING MACHINE

AN inexpensive production machine especially adapted for marking on cylindrical pieces. Uses solid dies or dependable FORCE Interchangeable Steel Type which permits quick changing of the marking code.

There is a FORCE device for every metal-marking requirement. Send for free catalog of indenting and embossing numbering machines, steel stamps and dies, steel type and holders, hand and power presses, rotary marking machines, etc.

WM. A. FORCE & COMPANY
INCORPORATED
216 NICHOLS AVENUE, BROOKLYN 8, NEW YORK, U.S.A.

The FORCE of NUMBERS

GEAR CUTTING MACHINES

Well Designed
Good Features
Create Production Advantages

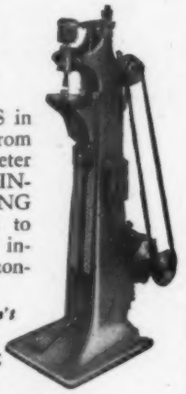
43 Years' Experience

NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK 5, NEW JERSEY
FRANK E. EBERHARDT, *President*

GRANT

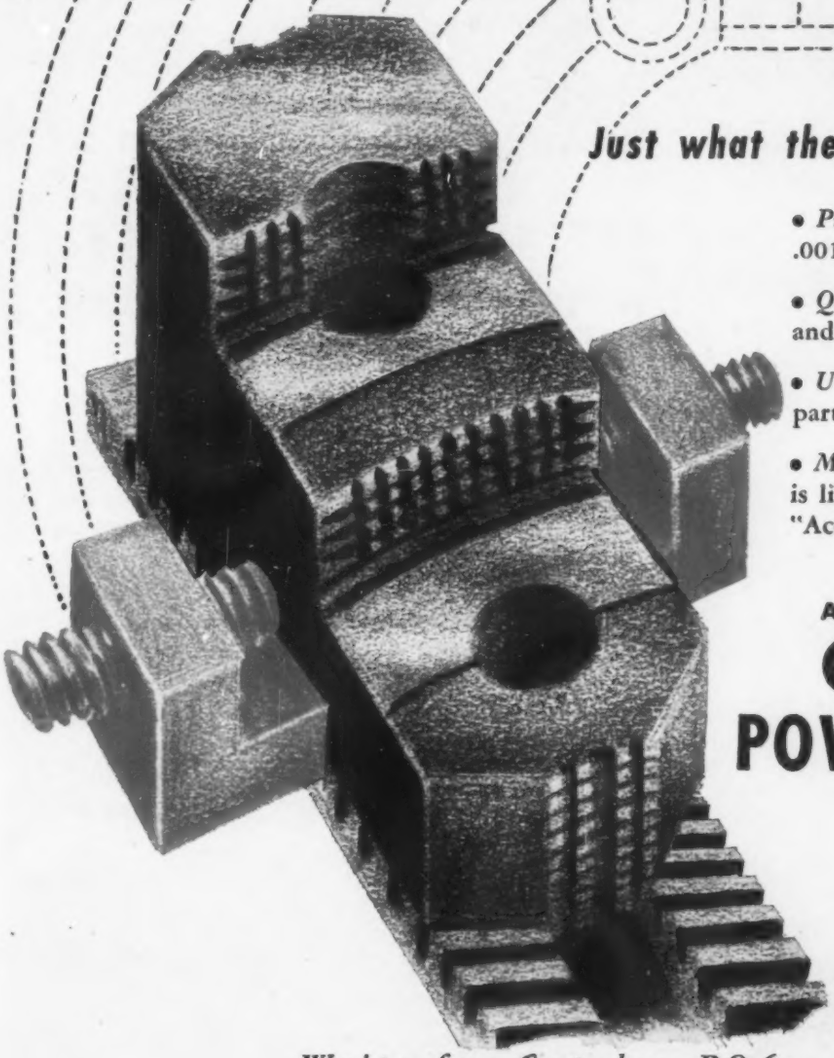
RIVETERS — PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

CUSHMAN "ACCRALOCK"



Just what the name implies

- *Precision* in jaw adjustment to within .001" concentricity.
- *Quick, positive lock* with the safety and rigidity of a solid jaw.
- *Utmost simplicity* with few sturdy parts.
- *Maintained accuracy* because there is little or no wear in operation of "Accralock" units.

An exclusive feature of

CUSHMAN POWER CHUCKS

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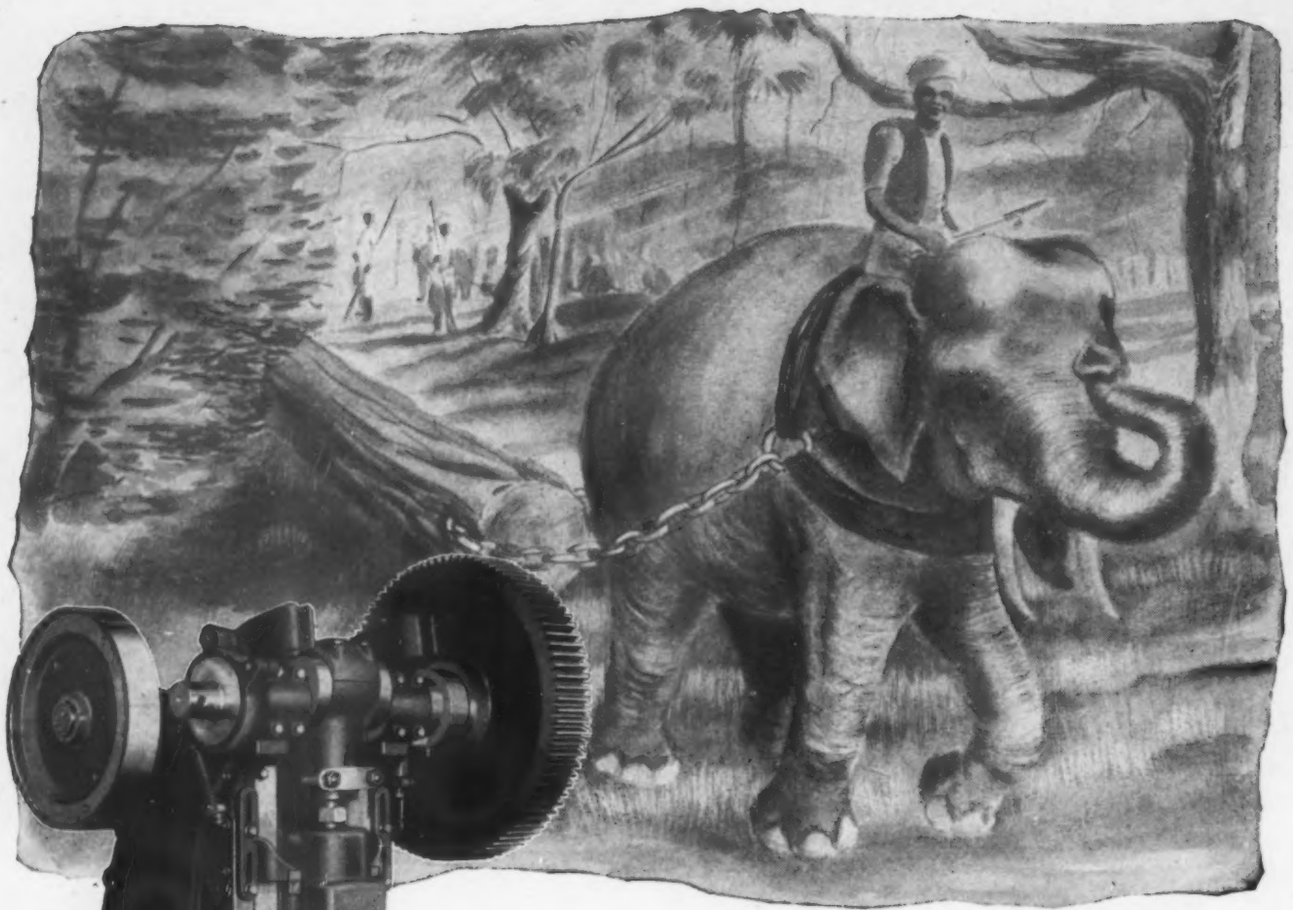
THE CUSHMAN CHUCK COMPANY, HARTFORD 2, CONNECTICUT



BETTER PERFORMANCE ON THE TOUGHEST JOBS

Put your toughest job on a Federal Press and watch the performance curve shoot upward! For Federals have the reputation of increasing production on almost any job. Furthermore, Federals not only handle with ease the secondary operations common to ordinary presses, but primary and assembly work as well — in some cases perform intricate combinations of all three! Burnishing, broaching, forming, staking, and high speed marking are handled with ease. Production goes up — costs come down. Equally important, Federal Presses are ruggedly built to stand up under hardest usage and give years of continuous service. Write today for latest catalog of complete Federal line.

THE FEDERAL PRESS CO.

147 Division Street, Elkhart, Ind. — Telephone 2831

FEATURES

Front Operated Recline • Timken Roller Bearing Flywheels • Frame - Anchored Knockout Bracket • Symmetrical Rams • Longer "V" Ways and Gibs • Oversize Crankshafts • Non-Repeat Clutch Mechanism • Safety Latch Spring

FEDERAL
OPEN-BACK — INCLINABLE
PRESSES

AVAILABLE IN 8 SIZES — CAPACITY, 6 TO 80 TONS

Because Federal Presses are in such great demand today, delay in shipment is unavoidable. But remember — Federals are worth waiting for!

NEW AO R-2000 RESPIRATOR with Chemically Treated Filter

PROTECTS AGAINST DUSTS 24 MILLIONTHS OF AN INCH IN DIAMETER

First of its kind, the R-2000 RESPIRATOR features a chemically* treated felt filter of approximately five inches which does the work of previous filters eight times as large in area — and protects workers from poisonous dusts as small as 24 millionths of an inch diameter! This new and important development safeguards against a *combination of all dusts* — toxic, nuisance and pneumoconiosis-producing, while providing increased front and side vision due to reduced size of the filter container.

The advance in filtering efficiency is without any increase in low breathing resistance and the compact overall size of the respirator offers a new high in wearer comfort. For added economy, the disposable filter is equipped with a gauze pre-filter which extends filter life by preventing the passage of larger particles of dust and dirt. A special lightweight easy-to-attach face shield is available for use with the respirator. This shield protects eyes and upper face against impact of foreign particles. Approved by the Bureau of Mines.

*Provides 40 to 1 greater efficiency over untreated filters.

Safety Division

American Optical COMPANY

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

Have YOU tried the CARBOLOY® dresser with "EDUCATED DIAMONDS"

THEY CAN'T COME LOOSE! THEY STAND ABUSE!

"Educated" is the word for the diamonds in the Carboloy Dresser. They know their job and STAY right with it.

Here's a diamond dresser with lots of diamonds that just *can't* come loose—stand abuse—need no remounting. No diamonds to lose—they're permanently impregnated in a special carbide matrix.

Operators and management *both* like the Carboloy Dresser because it gives more satisfaction and more savings. It permits faster traverse speeds—saves up to 40% in dressing costs. It gives better quality dressings—quicker and easier.

For diamond dressing silicon carbide and aluminum oxide wheels.

#2B	#3C	#4D
$11.90	$15.65	$19.00

Available in 8 Standard Mountings and Hand Dresser. Send for new free booklet No. DR-103

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DIAMOND DRESSERS

Tear Out and MAIL!

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Send me free booklet showing how Carboloy DIAMOND Dressers save up to 40% and give greater satisfaction.

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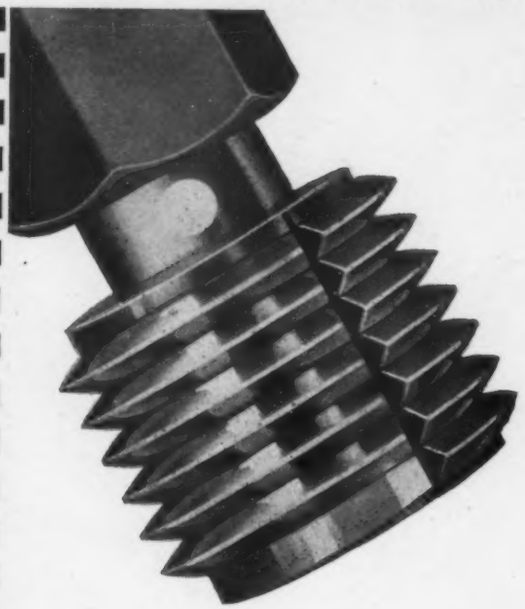
That Unseen Extra Quality



Drunken Threads?

Republic's thread plugs are checked on a specially built instrument known as the drunken lead checker, which reads directly to .0001. "Drunkenness" in setting plugs makes proper adjusting of the rings almost impossible as a "jump" will be noted as the ring is set to the master.

Republic's gages with "THAT UNSEEN EXTRA QUALITY" cost no more.

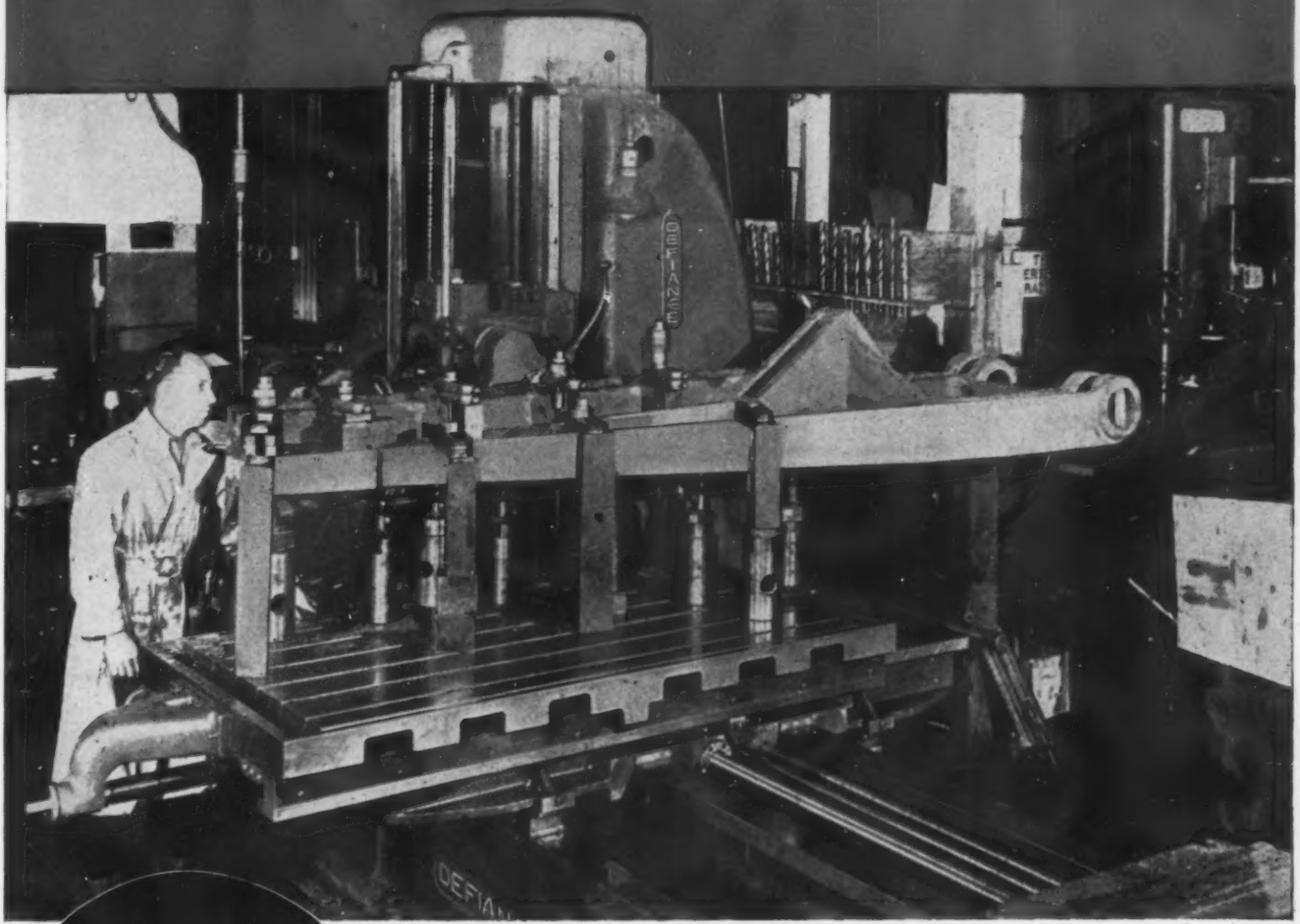
RELY ON REPUBLIC

REPUBLIC GAGE

DETROIT 21, MICHIGAN

Boring with Accuracy

Where *Overhang* and *High Mounting* of work DEMAND EXTRA RIGIDITY!



THIS DEFIANCE BORING MILL *Operating 16 Hours a day* at HUFFORD MACHINE WORKS, INC.

Here's a job with unusual stresses—due to overhang of the extra long part being machined and high mounting of the work on the table. The part is one of the arms of stretch forming machines built by Hufford Machine Works, Inc., Redondo Beach, Calif.

Defiance Model 25-A Boring Mill used continuously by this plant since 1943 has the *right* features for difficult work like this! With extra strong saddle and table ways, well ribbed table, and base with outboard bearings—Defiance has the *rigidity* to maintain *accuracy*. Defiance Machines are extremely versatile—adaptable to a wide range of boring, milling, drilling and tapping operations . . . helping to increase production, save labor and cut costs! Write concerning your requirements. Defiance Machine Works, Inc., Defiance, Ohio.

DEFIANCE

BORING . . . MILLING . . . DRILLING TAPPING MACHINES

97 YEARS OF PRECISION MANUFACTURING

UNIQUE APPLICATION OF POWER BRUSHING CUTS CLUTCH CLEANING COST 50%

HERE at Monmouth Products Company, Cleveland, Ohio, automotive parts manufacturer, you see an example of how brushes and a little brain work can produce handsome dollar savings daily. The job of cleaning dirt and excess oil and grease from clutch plates had previously been done manually. It took four girls and mountainous quantities of rags to process about 3000 plates a day.

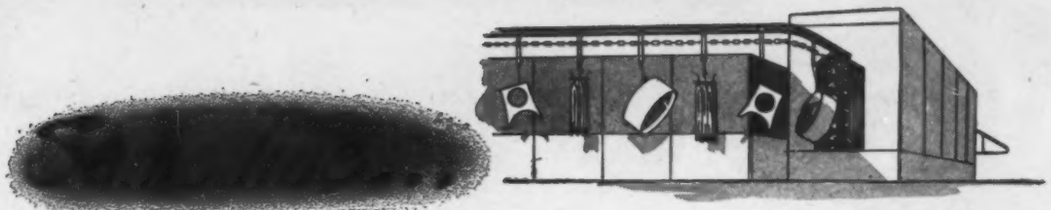
Then Osborn and Monmouth engineers joined forces to develop this automatic brushing machine. It consists of a synchronized turntable, geared to keep pace with the punch press output. On the turntable are six loading stations in the form of spindles. As the turntable revolves, each clutch plate passes between two sets of Osborn Monarch tampico brushes. The result is a perfect cleaning job with just enough grease remaining to serve as a protective coating. Only two girls are required to remove and inspect the plates and production has been increased to 3100 daily.

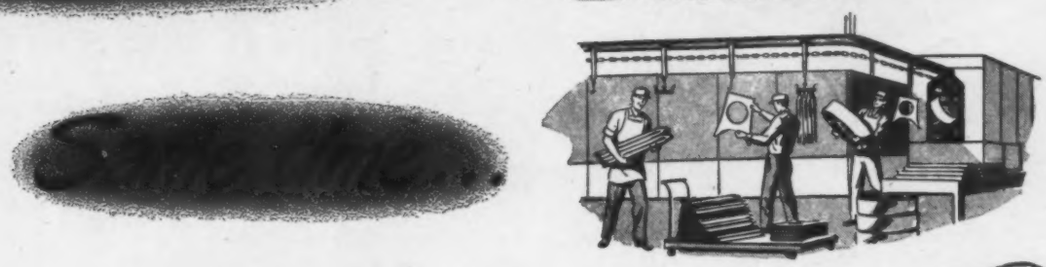
Costs halved and production increased! Would you like to share in such savings? An Osborn sales engineer will be glad to check your operations for possible profitable applications of power brushes. The next move is yours—just write . . .

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue *Cleveland, Ohio*

Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY





PROTECTED BY Bonderite HOLDS PAINT TO METAL FOR CORROSION RESISTANCE

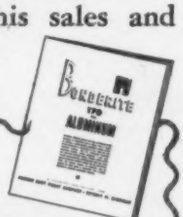
BONDERIZE

Steel, Zinc, Aluminum!

Steel, zinc, aluminum, and their alloys—in sheet metal or in castings—can now be Bonderized with the same process and at the same time. For manufacturers with mixed metal production, here is added manufacturing efficiency and production economy.

On all these metals, the Bonderizing treatment converts the surface to a tight, nonmetallic crystalline phosphate coating which forms a secure anchor for paint, inhibits rust and corrosion, and promotes lasting fine appearance. Now your product can have the same effective fine finish protection used on automobiles, refrigerators, home freezers, and other products that emphasize lasting beauty.

Bonderizing is economical, simple, and dependable. Investigate this sales and performance feature now!



SEND FOR FREE TECHNICAL BULLETIN

Full information! Write today for your copy of technical bulletin on Bonderizing for mixed production!

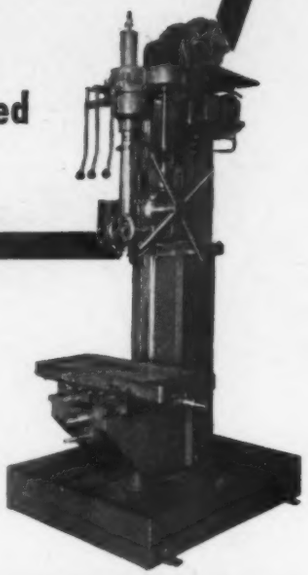
PARKER RUST PROOF COMPANY, 2196 East Milwaukee Ave., Detroit 11, Michigan

BONDERIZING		PARKERIZING		PARCO LUBRIZING
Holds Paint to Metal	PARKER PROCESSES	Inhibits Rust	PARKER PROCESSES	Retards Wear on Friction Surfaces

Bonderite, Parco, Parco Lubrite—Reg. U. S. Pat. Off.

BAKER

Universal Quick Change Drill ...with 12 Instantaneous Changes of Speed and with Selective Feed



Backed by *Baker's* 70 years of "know-how" in the manufacture of machine tools, this Baker Drill is *heavy, rigid,* and *versatile* . . . Assures maximum out of twist drills up to 1½" diameter. Engineered to solve your drilling, facing, and heavy duty boring problems, Baker Model 150 (shown here) provides 12 instantaneous changes of speed and has selective feed. Speed and feed changes convenient to the operator.

Baker-built machines are thoroughly dependable . . . engineered to do the job *better* and thereby help *increase productivity.* Whatever your needs for Drilling, Tapping, Keyseating or Contour Grinding machinery see Baker for Dependability!

BAKER BROTHERS, Inc., Toledo, Ohio

DRILLING...TAPPING...KEYSEATING...CONTOUR GRINDING MACHINES

for Sawing METAL as HARD as a FILE or Trimming FORMED PARTS - FAST!

Actual photo of file friction sawn on Tannewitz High Speed Band Saw

Tannewitz HIGH SPEED BAND SAWS

Cost reductions that are downright amazing are effected in the cutting of an extremely wide variety of materials by friction sawing with TANNEWITZ HIGH SPEED BAND SAWS: flat sheets, hardened or soft steels, armor plate plastics, and many others. Formed aluminum parts can be trimmed without using a rest of any kind. Whatever your cutting problem, chances are it can be done faster and better with TANNEWITZ HIGH SPEED BAND SAWS. Write for booklet: "FRICTION SAWING."

THE TANNEWITZ WORKS
GRAND RAPIDS 4, MICHIGAN

"Standard" TURKS HEADS

ROLL 4 SIDES IN ONE OPERATION

"Standard" Turks Heads (adjustable draw plates) draw rod accurately to triangular, rectangular and special shapes—both plain and ornamental. All four sides are rolled simultaneously. "Standard" Turks Heads, universal and plain types, are available in a wide range of capacities, with friction or power driven rolls, tandem mountings and special attachments. Widely used as running-in guide and sizing facility on pay-off side of rolling mills and wire flattening mills. Write for Bulletin TH.

STANDARD MACHINERY COMPANY
1565 Elmwood Avenue Providence 7, R. I.

MANUFACTURERS OF
Power Presses to 500 Tons • Rolling Mills • Swagers • Turks Heads • Steel Die Sets

Apex has the right bit for YOU

Whether you use Phillips, Frearson, Clutch Head, Slotted, Allen or Hex Head Screws and no matter what make of electric, air or spiral drivers you use—Apex has the *right* bit for YOU.

Apex bit holders and insert bits do a big job with a minimum inventory. Just obtain the bit holders you need (they last indefinitely) then order tips (of whatever type you need) and discard them as they wear out. Interchangeable insert bits are furnished for all types of screws.

The useful life of the one-piece bits for Phillips and Frearson recessed screws is far from over when they become worn by long use. You can increase their service life through Apex Reconditioning Service—which restores the bits to their original condition at a considerable saving over the cost of new bits. Write for Catalog No. 20.

APEX

Screwdriver Bits

THE APEX MACHINE & TOOL COMPANY, 1030 S. Patterson Blvd., Dayton 2, Ohio

Safety Friction Tapping Chucks • Quick Change and Positive Drive Drill Chucks • Vertical Float Tapping Chucks • Parallel Floating Tool Holders • Power Bits for Phillips, Slotted Head, Frearson and Clutch Head Screws • Hand Drivers for Phillips and Clutch Head Screws • Aircraft and Industrial Universal Joints • Sockets and Universal Joint Socket Wrenches

Don't lose your head over shortages!

When you need supplies and replacement parts *fast*, specify Air Express—and forget your worries. Your shipment arrives in *hours*, not days. Air Express brings your most distant suppliers close at hand. Even coast-to-coast overnight shipments are now routine.

Because Air Express goes on every flight of all Scheduled Airlines, your shipments never "grow moss"—never have to wait around for loads to accumulate. Rates are low, and you're getting better service than ever because of faster planes and increased schedules. For better, *more profitable* customer service, use Air Express regularly.

Specify Air Express - it's Good Business

- Low rates—special pick-up and delivery in principal U.S. towns and cities at no extra cost.
- Moves on all flights of all Scheduled Airlines.
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Just phone your local Air Express Division, Railway Express Agency, for fast shipping action . . . Write today for Schedule of Domestic and International Rates. Address Air Express, 230 Park Avenue, New York 17. Or ask for it at any Airline or Railway Express Office. Air Express Division, Railway Express Agency, representing the Scheduled Airlines of the United States.

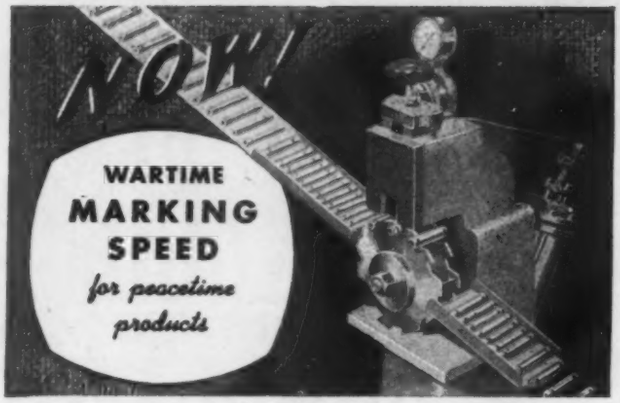
AIR EXPRESS

AIR EXPRESS

GETS THERE FIRST

Fastest delivery—at low rates

Refrigerator parts (120 lbs.) in Detroit were needed in West Palm Beach *fast*. Picked up 4:20 PM the 16th, delivered 10 AM on 17th. 1135 miles, Air Express charge only $40.52. Other rates, any distance, similarly inexpensive and *fast*.



Out of the urgent demand for precision marking at highest possible production speeds have come new Noblewest marking machines for marking your peacetime products faster — better — cheaper. Model 156, illustrated, marks tubular parts. Adaptable to magazine loading. Has automatic positioning, and unloading. Noblewest Pneumatic Pressure Compensator assures uniform impression. For the answer to your marking problem write Noble & Westbrook Manufacturing Co., 17 Westbrook St., East Hartford 8, Conn.

MARK IT BEST WITH

NOBLEWEST

Fine Marking Tools

If you have a SPECIAL PROBLEM

in any of these operations, where precision work is demanded and where greater production at man-hour savings is paramount—

• BORING—rough, semi-finish and finish • MILLING (special types) • STRAIGHT LINE DRILLING • UNIVERSAL ADJUSTABLE SPINDLE DRILLING • HONING • TAPPING • REAMING • COUNTERBORING • VERTICAL AND WAY-TYPE EQUIPMENT

then a Moline Multiple Spindle Specially Designed machine tool is your answer. Moline tools are ruggedly built and engineered to fit your PARTICULAR requirements, they're made to last for years, they're easy to change over to other jobs, they do better work at less cost and stand up to it longer.

For YOUR special problem, go "HOLE-HOG," write us for any information you may need.

MOLINE TOOL CO.

100 20th Street Moline, Illinois

Sterling
CUT OFF WHEELS
WHEN TIME IS SHORT AND THE JOB IS LONG
YOU CAN USE THEM TO GOOD ADVANTAGE...
For extreme accuracy and economical performance, Sterling Cut Off Wheels are ideal. They will readily cut unannealed alloy steels to limits within 0.005-inch. Ends are smooth, making a second grinding operation unnecessary. For a quicker job, well done, specify Sterling and be certain of success. Our engineers will gladly supply specifications suitable for solving your cut off problem. Write anytime!
"THE WHEELS of INDUSTRY"
STERLING
• Send for Sterling's folder on cut off operations. It's free!
• STERLING ABRASIVES •
THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO
THE WHEELS OF INDUSTRY

Answers hundreds of questions on machine-shop standards and practice — *in everyday machine-shop work*

Revised 8th Edition

1537 pages of most dependable data on all branches of machine-shop and drafting-room practice; over 2500 illustrations, diagrams, and tables; in one handy volume, 4½ x 7, $5.00

Now includes the Wartime Data Supplement, giving you benefits of many time and material saving shortcuts developed in war work.

American Machinists' HANDBOOK

By FRED H. COLVIN

Editor Emeritus, *American Machinist*

and FRANK A. STANLEY

Editor, Western Machinery and Steel World

Just where can any worker find as much and so wide a variety of helpful material as is given in this well-planned and well-organized handbook? Just think of being able to find the answer—the "right" answer—to any question—"quickly"—layouts, feeds, speeds, tools, jigs, fixtures, materials, standards, tolerances—a wealth of the most useful information applicable to problems that arise in every type of shop or plant, whatever its size, whatever its special problems.

28 helpful sections

Screw Threads
Pipe and Pipe Threads
Drilling
Reamers and Reaming
Taps and Tapping
Files and Work Benches
Babbitting, Brazing, Soldering and Welding
Gearing
Turning and Boring
Milling Machine Feeds and Speeds
Grinding, Honing and Lapping
Screw Machine Tools, Speeds
Punch Press Tools
Broaches and Broaching
Bolts, Nuts and Screws
Measuring and Fitting
Tapers and Dovetails
Shop and Drawing Room Standards
Wire Gauges and Stock Weights
Horse-power, Belts and Shafting
Metals and Other Materials
Machine Forgings
Knots and Slings
General Reference Tables
Automotive Data
Railroad Shop Data
Shop Trigonometry
Dictionary of Shop Terms

Don't wait till time of acute need to investigate this book, recognized everywhere as a standard manual of data, methods and definitions for apprentices, machinists, toolmakers, draftsmen, designers, foremen, superintendents, and all others who need dependable material in the machine-shop and metalworking field. Send for a copy today. Even a few accurate, up-to-date facts from this handy, "pocket-companion" volume will more than repay you its cost.

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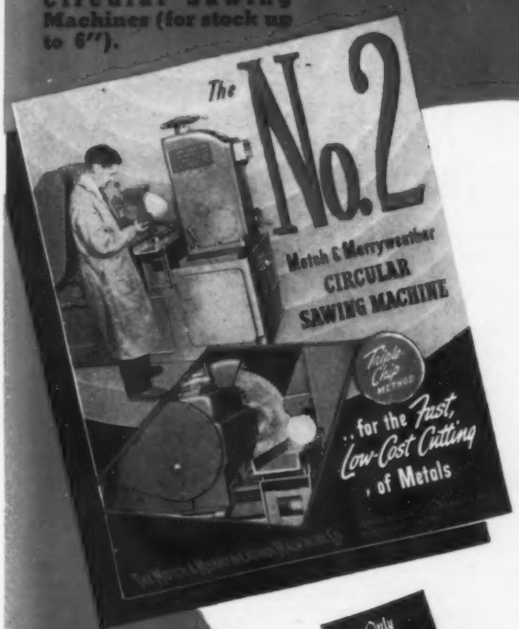

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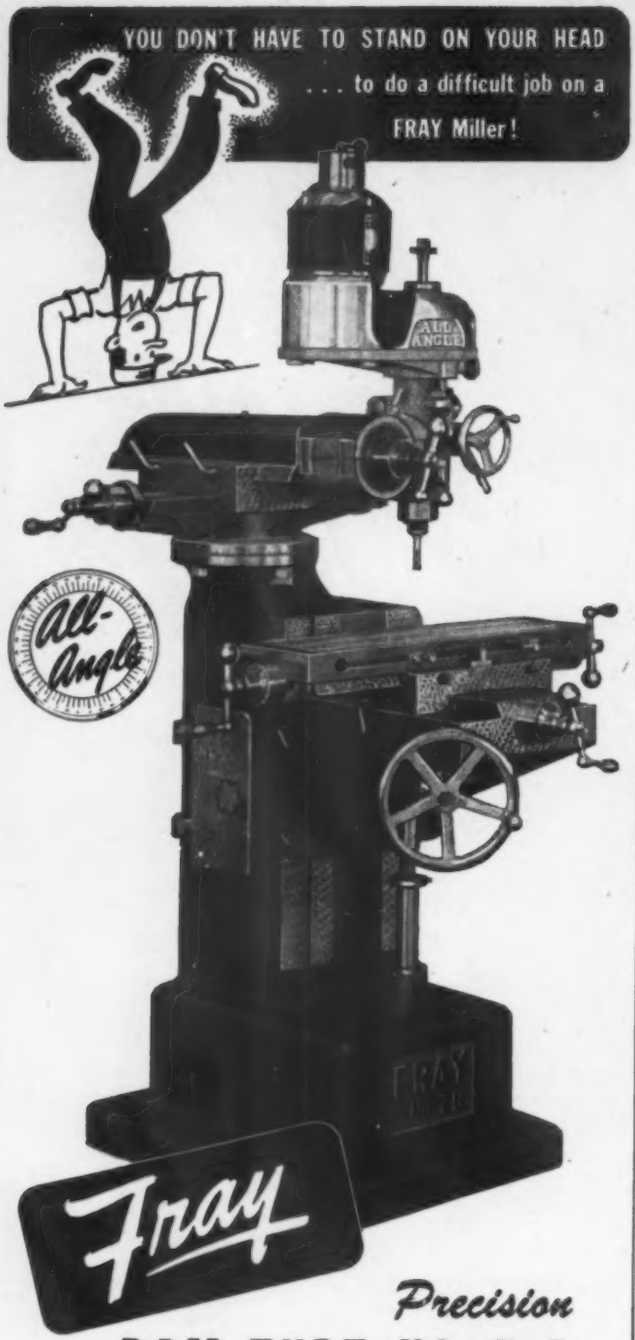

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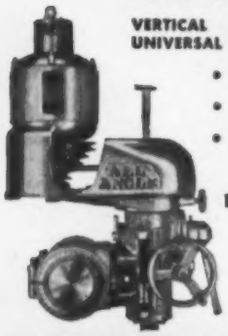

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- Adaptable to all Milling Machines

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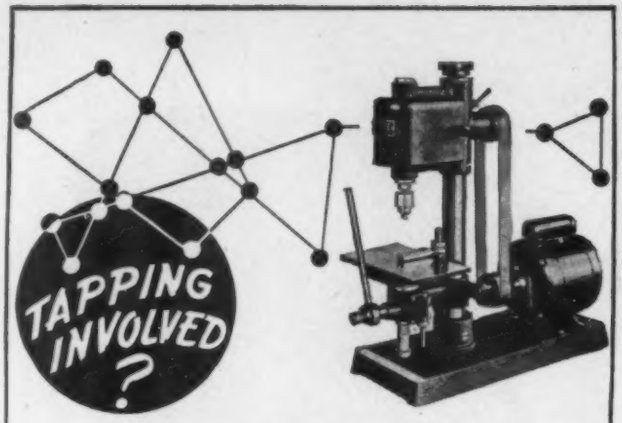

Small hole tapping (from the smallest and finest tap to 10-32 inclusive) need not be involved. With the Hamilton Super Sensitive Tapping Machine small hole tapping becomes routine. "Fool proof" in operation, the newest employee can become expert during the first day.

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THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

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CINCINNATI, OHIO

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for ball bearings . . .

HOW TO LEAVE a ball bearing unencumbered as a bathing beauty and yet protect it with work clothes snug-fitted to thousandths of an inch? This job of sealing or shielding a ball bearing is a double job of keeping lubricant in and contaminants out. More than a quarter century of Fafnir research and development have been devoted to this single factor of ball bearing design. The result . . . a whole wardrobe of tailor-made work clothes that wrap up a ball bearing like a cocoon yet allow it perfect freedom of action . . . for work in cement mills, face to face with corrosive fumes and live steam, buried in abrasive sand or up to its shoulders in muck and water.

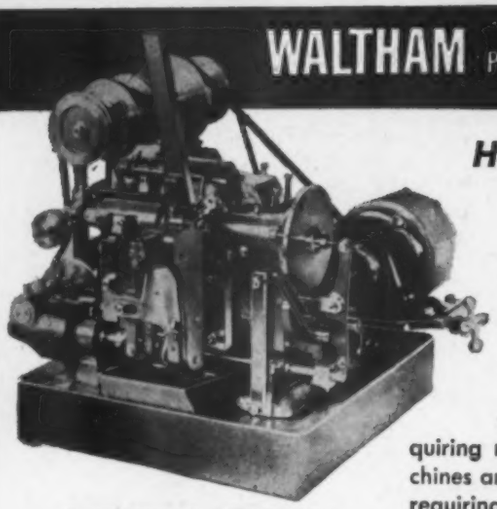
Some of these "wrap-ups" are simple as a work apron . . . just a precision-fitted single shield. Others are assemblies of felt rings and steel baffles. Another is an ingenious labyrinth of steel plates to foil either stray lubricant or contaminants. And the newest is a regular diving suit for complete sealing; yet it can be removed and replaced with a penknife.

None of which is half as interesting as the fact that the very first protective device for ball bearings was developed by Fafnir at the request of a manufacturer. It's Fafnir's readiness to work mind-to-mind with manufacturers that prompts so many developers of new products to think of Fafnir first. The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR BALL BEARINGS

MOST COMPLETE LINE IN AMERICA

WALTHAM PINION & GEAR CUTTING MACHINES

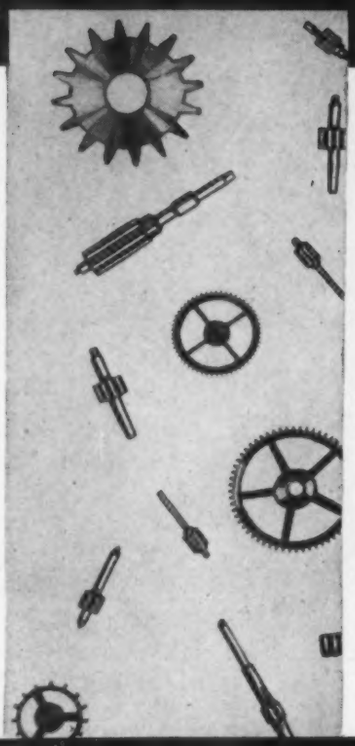


Highly productive—fast and accurate

These machines—made in single-cut, multiple-cut and magazine-feed types—are designed for the fast, precision production of gears and pinions for watches, instruments, fuses, etc. They are simple to operate, requiring no special skill. Magazine-feed machines are fully automatic, the other machines requiring positioning of blank and starting by hand.

Drive for these machines is either from countershaft or by individual motor. On motor driven machines, V-belts drive cutter spindle, worm shaft and pump.

Illustrated literature and detailed specifications are available promptly on request.



SPECIFICATIONS

PINION MACHINES

Diameter capacity, approx. ½"
Coarsest pitch about 32 D.P.
Strokes of Work slide for pinions—.24" to .45"
Strokes of work slide for stacked gears —.85 to 1"

GEAR MACHINES

Pitch diameter, capacity 1½"
Strokes for work slide, .40", .65", 1.00", 1.25"

WALTHAM MACHINE WORKS
WALTHAM, MASS.

WALTHAM
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MULTI-DRILL
for Production Drilling

9" DRILLING AREA
—AVAILABLE WITH 2 TO 8 SPINDLES

- Designed for accurate, high speed production drilling
- RUGGED CONSTRUCTION
- Quick, easy adjustments to **any** hole pattern on or within a 9" circle; ½" minimum center distances; Drill sizes 1/32" to 3/8"
- Special adaptations available.

MULTI-DRILLS are made in other sizes and models.

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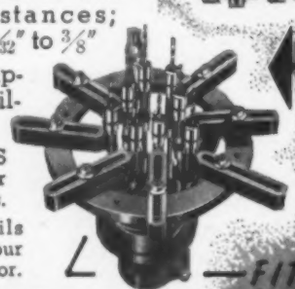
Model 900



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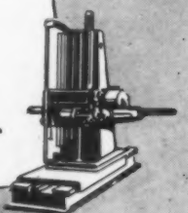

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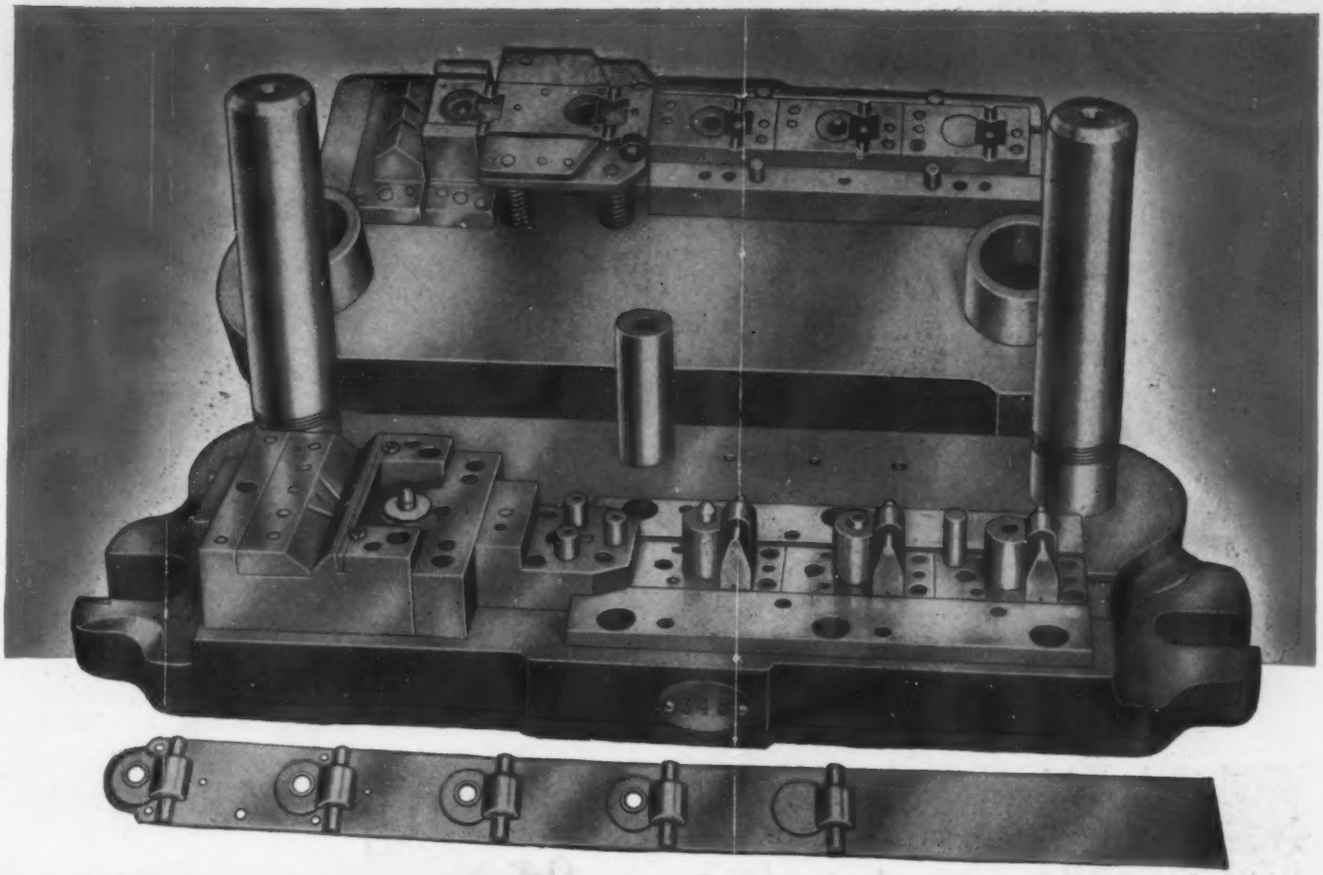
CINCINNATI, OHIO



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This CROMOVAN DIE was used in the production of housings for the tilt mechanism of venetian blind hardware. Its performance attests again the high quality and desirable characteristics of Cromovan die steel for high production, accuracy and unusually long life.

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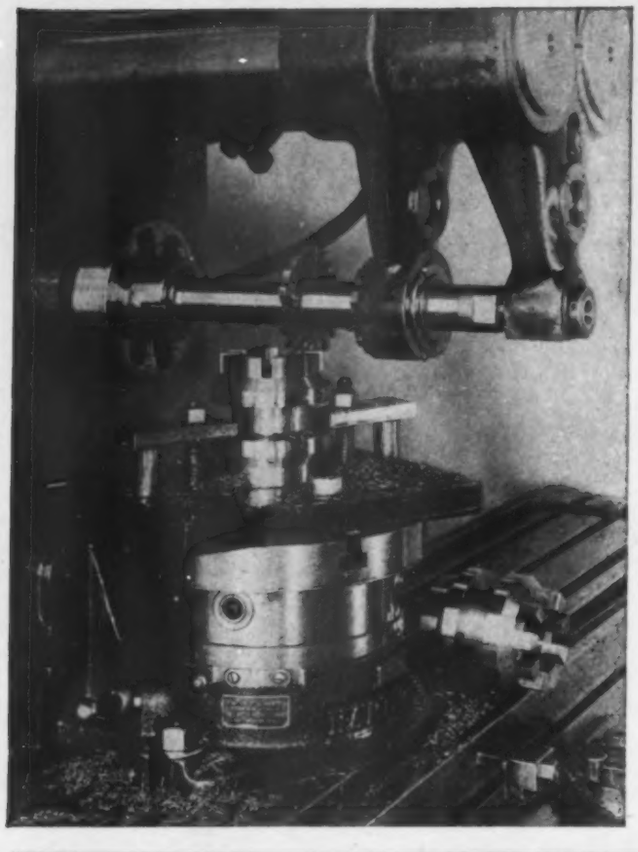

MILLING and INDEXING with the HARTFORD SUPER SPACER are fast and foolproof

Horizontal milling on a double-end piece, as shown here, gives an idea of the kind of work which can be handled on the HARTFORD SUPER-SPACER.

In this application, the SUPER-SPACER is equipped with a face plate on which a special holding fixture is mounted. When milling operations are completed on one end of the piece, the part is reversed and the same operations repeated on the other end. Secure holding of the work is assured at all times.

Many attachments and fixtures are available or have been developed to provide wide utility and convenient set-ups. Faster, foolproof indexing on such operations as milling, drilling, grinding, slotting and jig boring is assured regardless of how the SUPER-SPACER is used.

Send for illustrated literature showing some of the many typical applications of the HARTFORD SUPER-SPACER

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INCREASE PRODUCTION IMPROVE QUALITY USE ANTON PARALLELS ANTON PARALLELS FILL A LONG-FELT NEED—Permanently straight and accurate, yet priced for general machine shop use. All fully guaranteed to be within the limits specified. Maximum size tolerance .001 inch on ground sides. Maximum variation in parallelism and straightness within length, .0001. Rockwell "C" hardness 65 up.

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Grinding and Cutting Oils and Lubricants for Every Metal Working Purpose

THE WHITE & BAGLEY COMPANY
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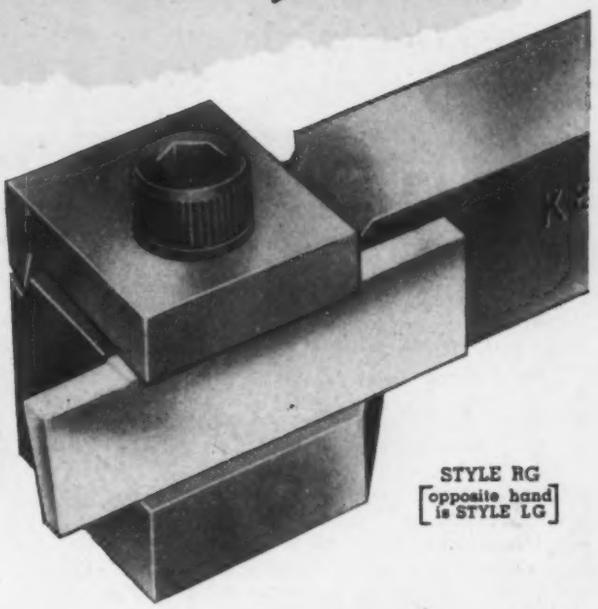
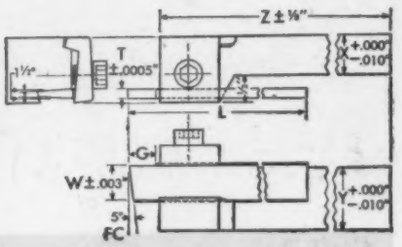
Another KENNAMETAL *First!*

This New GROOVING and CUT-OFF TOOL



STYLE RG
[opposite hand is STYLE LG]

Combines the outstanding rigidity and durability of solid Kennametal blades with the highly successful clamped-in method of mounting.



Kennametal solid grooving blades have been outstandingly successful on multiple blade jobs, such as piston-grooving of light alloys, bronze, and cast iron. Their great rigidity prevents "weaving." They stay sharp much longer, and permit many more regrinds than conventional tools having brazed-in tips.

Now, we have developed a new line of tools that extend the advantages of using solid Kennametal blades to single grooving operations, such as on turret lathes. These tools comprise an advanceable Kennametal blade securely clamped in position in a heat-treated steel holder. The clamping arrangement is such that the blade can be advanced time and again, after each resharpening, until about half its length has been utilized.

Standard Styles RG and LG tools are available having blades of the following thicknesses: .125", .1875", and .250". As supplied, these blades have zero side rake and zero cutting edge angle, and are suitable for normal grooving operations. For cutting off jobs, the cutting edge angle is ground to the usual 5°. Non-standard blades of any thickness from .125" to .250" can be supplied, for use in the standard holders.

Catalog 47 gives complete specifications and prices. Write for a copy.

KENNAMETAL
SUPERIOR CEMENTED CARBIDES
TRADE MARK REG U. S. PAT. OFF.
KENNAMETAL *Inc.*, LATROBE, PA.

Outstanding Features

- Rigid Kennametal blade stays sharp much longer.
- Blade can be advanced and reground many times.
- Replacement blades are interchangeable—may be used in either Style RG or LG tools.
- Tool holders accommodate range of blade thicknesses as follows:

  ¾" x 1" x 6" holder accommodates blades from .080" to .149" thickness.

  ¾" x 1¼" x 8", and ¾" x 1½" x 9" holders accommodate blades from .150" to .250" thickness.

From A to Z...

Fred Colvin's latest book covers—

by Fred Colvin

Editor Emeritus, *American Machinist*

208 pages, 5¾ x 7½ 110 photographs and tables, $2.50

Just Published

Here is a book written especially for the enterprising mechanic who wants to start a profitable machine shop business for himself. Drawing on the experience gained through 60 years of direct, personal contact with shops and shop work of many kinds and sizes, the author points up the various problems you face as a business novice—provides you with page after page of valuable, common-sense advice for mastering these problems. The book is filled with illustrative examples that show you the mistakes others have made—and how to avoid making the same mistakes yourself.

Shows you how to run a shop more skilfully, profitably

This practical manual puts you in command of all the important management pointers that make for more efficient and profitable operation. It discusses such important factors as: how to choose a suitable location, how to select machines and other equipment, whether to buy new, or second-hand, machines, where and how to store materials, how to make charges for different kinds of work. It covers both managing the work and supervising your employees, and points out ways to adapt your shop to handle specialized jobs with limited equipment.

This table of contents shows you the complete coverage:

1. Starting a Small Shop
2. Selecting Machines and Tools
3. Small Shop Layout
4. Shop Furniture
5. Drills and Drilling
6. Filing and Sawing
7. Engine Lathe Work
8. Milling Machine Work
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Covers different machining methods —includes time-saving tables

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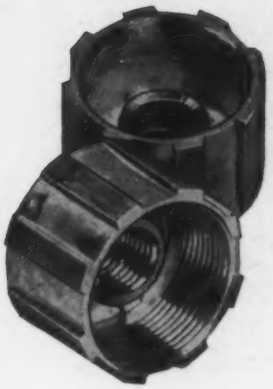


9 seconds

TAPPING TIME: 18 SECONDS

Die-cast aluminum pistons of popular Gabriel Aerotype Shock Absorbers have two concentric tapped holes. One, in the skirt, is 1" diam., 20 pitch, to receive the piston head. The other, 7/16" diam., also 20 pitch, receives the shaft. Tapping time, using two machines with cross-slide feed, was 9 seconds for each hole—18 seconds per piece.

Cost-wise Gabriel production executives reasoned that, if the two holes could be tapped simultaneously, tapping time would be cut in half. Ingeniously, they bored out the center of the larger tap and fitted the smaller one into it, producing a tool to do the job.

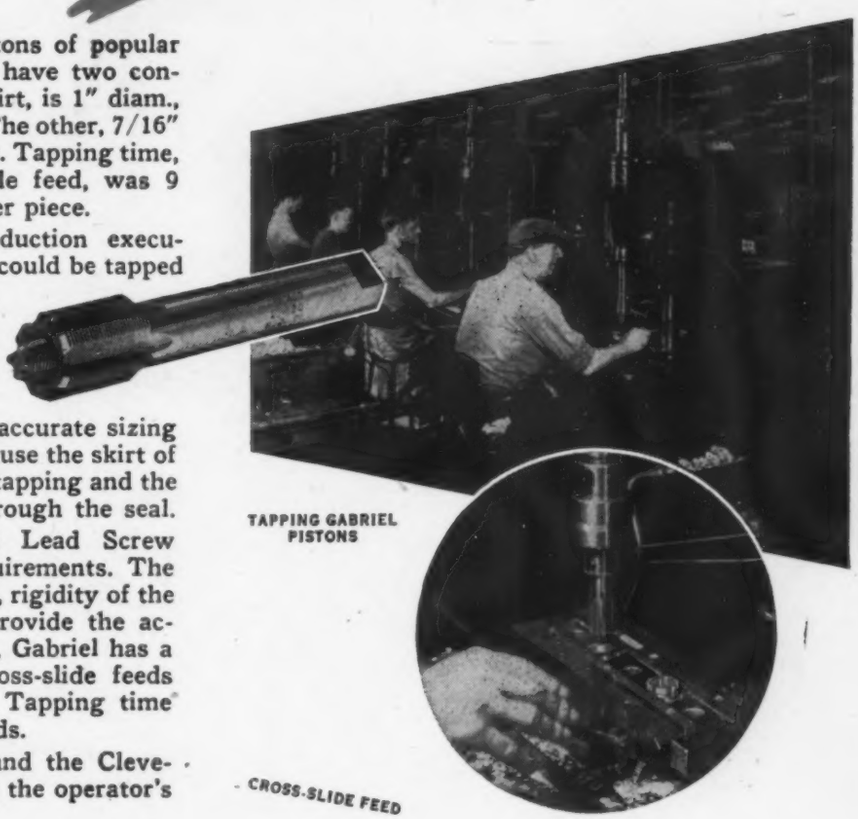
But perfect alignment, accurate sizing and correct depth were essential because the skirt of the piston is only 3/32" thick before tapping and the shaft must be precisely centered through the seal.

Fortunately, Cleveland Lead Screw Tapping machines meet all these requirements. The hardened and ground lead-screw feed, rigidity of the spindle and precise depth control provide the accuracy needed for the job. So today, Gabriel has a battery of four Clevelands with cross-slide feeds tapping both holes simultaneously. Tapping time per piece has been reduced to 9 seconds.

Rejects are negligible and the Cleveland's enclosed coolant system under the operator's control assures maximum tap life.

Scores of Cleveland Tapping Machine users are enjoying similar tapping economies—even on Class 3 and 4 fits on a production basis.

If your product must be drilled or tapped ... one hole or a dozen ... Cleveland engineers can probably show you how to speed production and cut costs. Send blueprints and specifications or sample parts to The Cleveland Tapping Machine Company, Hartville, Ohio.



TAPPING GABRIEL PISTONS

CROSS-SLIDE FEED

Write for your Free Copy of the **PRODUCTION TAPPING GUIDE**— *a handbook of tapping information*

CLEVELAND *lead screw* **tapping machines**

Announcing the FORD *WHIPPET*

ELECTRIC HOIST

On behalf of your Ford Chain Block distributor, as well as ourselves, we take great pleasure in announcing this new postwar electric hoist . . . The streamlined *WHIPPET* offers a high degree of simplicity, durability and accessibility of parts. Yes, the *WHIPPET* is faster, safer, more powerful, more dependable. Capacities range from 250 to 2000 pounds. Ask your distributor or send for copy of new descriptive folder DH-1325.

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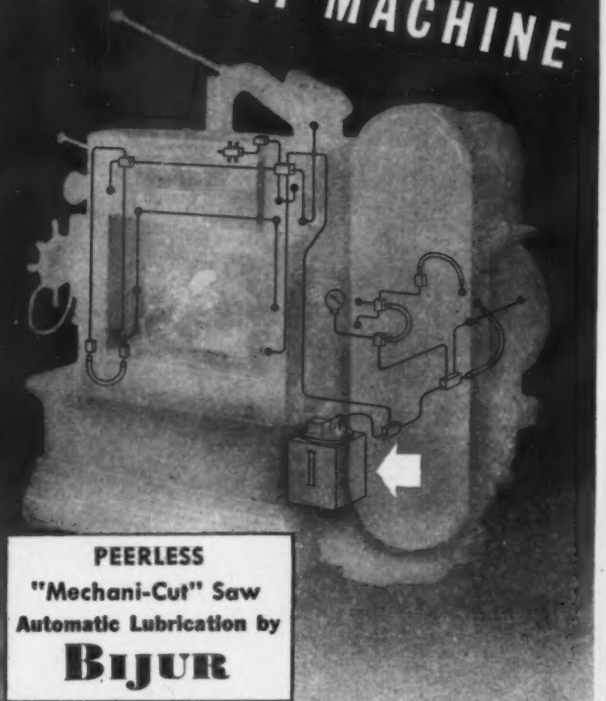
In Business for Your Safety

A BIJUR SYSTEM FOR EVERY MACHINE



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"Mechani-Cut" Saw
Automatic Lubrication by
BIJUR

how it works

Driven by the machine, a lubricator (arrow) discharges 60 drops of filtered oil every 4 minutes . . . oil is instantly force-fed thru a line of branched tubing to 22 heavy-duty ways and bearings . . . a meter-unit at each bearing apportions the required clean oil-film to the moving part automatically.

what it can do for you

A Bijur system increases production by eliminating down-time for oiling . . . cuts maintenance costs by reducing bearing wear . . . protects investment by lengthening effective machine life. It has done these things for the leading manufacturers of machine tools, printing presses and business machines. It can do the same for you.

For further details, write for Bulletin 4A

2399

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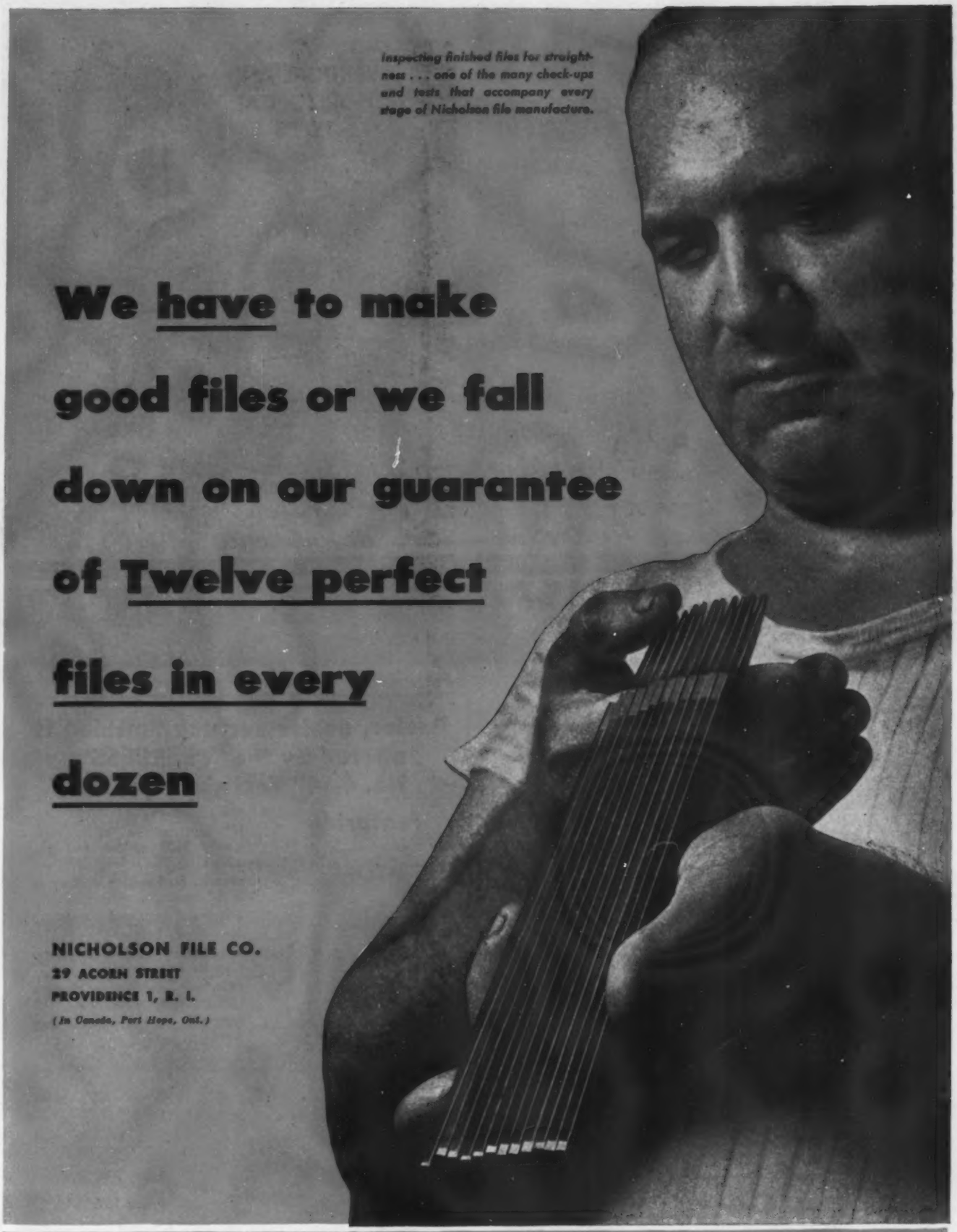


Inspecting finished files for straightness . . . one of the many check-ups and tests that accompany every stage of Nicholson file manufacture.

We have to make good files or we fall down on our guarantee of Twelve perfect files in every dozen

NICHOLSON FILE CO.
29 ACORN STREET
PROVIDENCE 1, R. I.
(In Canada, Port Hope, Ont.)

NICHOLSON FILES
for every purpose

Highest Production — Low Maintenance

MILLING • DRILLING • REAMING • BORING • PIPE THREADING • SPECIAL MACHINES

DAVIS & THOMPSON COMPANY

MANUFACTURERS: MACHINE TOOLS, MICROMETERS AND GAGES

MILWAUKEE WISCONSIN

*Fluidmotion** Radius and Angle Dressers save time in ACCURATE FORM DRESSING

"FLUIDMOTION", an exclusive J & S development, automatically blends any combination of angles and arcs in one continuous motion, with one setting, using one *handle*. Produces clean, precise form without tool or chatter marks. Available in models C, E and F . . . also the Form Master, an accurate lower priced dresser. Send for folder.

Fluidmotion FEATURES

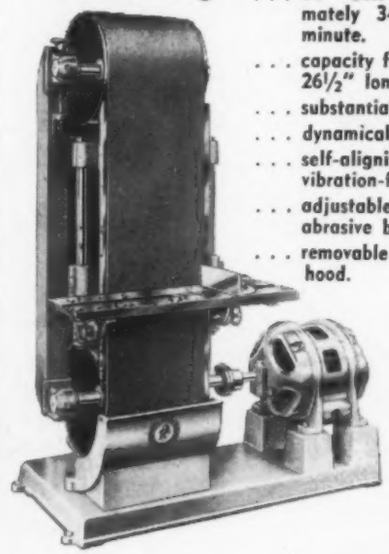
- automatic centering
- .0001" accuracy
- one setting per form
- 14" wheel capacity
- large radius range
- dustproof
- chatterless

*Reg. U.S. PAT. OFF.

J&S TOOL CO. 479 Main Street, East Orange, N. J.

Faster, easier surface finishing is offered by the "PEERLESS" No. 4-14" Vertical Machine

featuring



- . . . 14" belt running at approximately 3400 surface feet per minute.
- . . . capacity for handling work up to 26½" long.
- . . . substantial base and frames.
- . . . dynamically balanced drums.
- . . . self-aligning ball bearings for vibration-free operation.
- . . . adjustable and easily changed abrasive belt.
- . . . removable gage and hinged dust hood.

Height 67"; width 50"

Floor to belt table 27"

Table 15⅝"x35"

Drums 15"x15"

Write for illustrated literature

Production MACHINE COMPANY GREENFIELD, MASSACHUSETTS, U.S.A.

Here's the Easiest, Quickest saving you ever made!

Get 3 to 10 TIMES MORE PRODUCTION —without extra cost.

- More Pieces Between Grinds
- More Grinds Per Tool
- Less Down Time
- Lower Tool Cost

SIMPLY changing from your present carbide, to Improved TECO Cemented Carbide, will cut your turning, boring and facing costs to the bone. Improved TECO costs no more than ordinary carbides . . . but is producing 3 to 10 times more pieces per tool. It operates at higher speeds, heavier feeds, removes more metal, gives a better finish.

Try Improved TECO on any carbide job. Run as usual. Keep accurate check on the extra production you get. Then try it at higher speeds and feeds, for an additional surprise.

Send us details of your machining problem for recommendation. Latest catalog and price list sent on request.

TUNGSTEN ELECTRIC CORP. **39th ST., UNION CITY, N. J.**

Branch Office: 403 Western Reserve Bldg., Cleveland 13, Ohio
Representatives: Indianapolis, Ind., Detroit, Mich.

Manufacturers of

TECO CARBIDE BLANKS and TOOLS

All standard sizes and styles. When ordering any carbide tools specify "Teco—no substitute"

STUDY THIS PERFORMANCE!

	ROUGH BORE	FINISH BORE
Part Machined:	Piston Ring (3¼" I.D.)	Same
Material:	Fine Grain Cast Iron	Same
Operation:	Rough bore	Finish bore
Machine:	Carbo Lathe	Same
Depth Cut:	.060 to .100"	.010 to .012"
Feed:	.015"	.0075 to .010"
Speed:	225 RPM	225 RPM
Pieces per grind:	10,000	10,000
Previous carbide:	2,500	2,500

R-119-A TECO Blank used.
TECO Grade A-1 *both* operations.

Improved
TECO
CEMENTED CARBIDE

For over a quarter century—manufacturers of Tungsten Carbide—from ore to finished material.

★ 4 BIG REASONS WHY

the Standard COULTER "HT" Thread Milling Machine IS THE MACHINE FOR YOU!

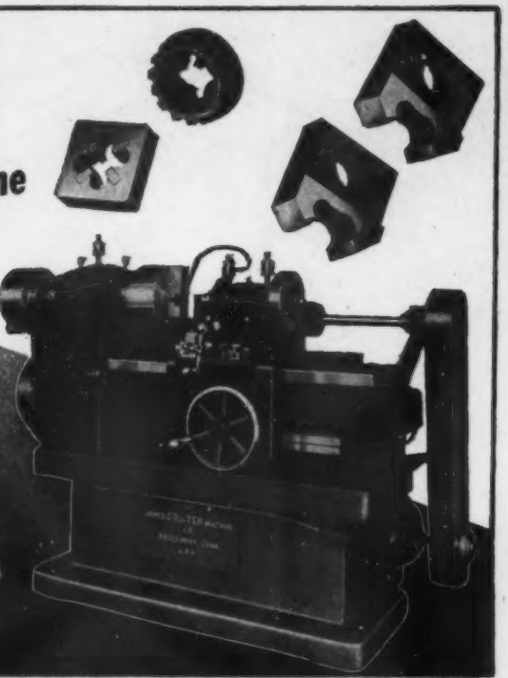
★ Any number of Lands eccentric or con-eccentric relief can be produced. Dies from ⅜" up to 2"

★ Equipped to give cutter speeds with infinite changes from 100 RPM to 650 RPM

★ Can thread round, square and inserted chaser dies

★ The most economical of ALL threading machines

Write for Full Particulars



PRODUCTION MACHINES SINCE 1896

The James COULTER Machine Co.

BRIDGEPORT · CONNECTICUT · U.S.A.

Your Coolant System is no better than the Pump that controls it

That is why so many machine tool builders have turned to the Ruthman Gusher Coolant Pump. They have learned by experience that Ruthman Pumps offer them numerous advantages which increase production and cut costs in metal-cutting operations.

Illustrated above is a Cleereman Drilling Machine equipped with a Model UL-7120 ¼ HP Ruthman Gusher Coolant Pump. Below is a Campbell 725 Auto Cutter equipped with a Model YLO-7100 ¼ HP-1725 RPM Ruthman Gusher Coolant Pump.

Write for Catalog 10-A

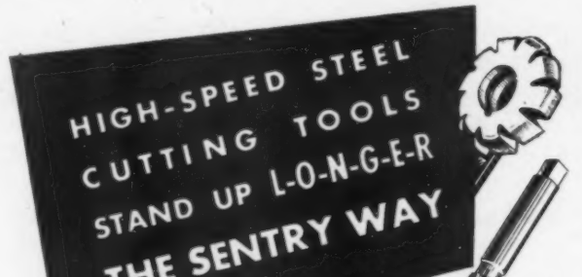
THE RUTHMAN MACHINERY CO.

1818 Reading Road Cincinnati, Ohio

Photos Courtesy: Bryant Machinery and Engineering Co., Chicago, Illinois

American Chain & Cable Co., Bridgeport, Conn.

HIGH-SPEED STEEL CUTTING TOOLS STAND UP L-O-N-G-E-R THE SENTRY WAY



Yes, your molybdenum, tungsten and cobalt high speed steel cutting tools will hold their cutting edges longer when hardened the Sentry Way. The approved Sentry Diamond Block Method of Atmospheric Control assures maximum hardness and uniform quality, no decarburization.

Sentry Electric Furnaces offer great flexibility, are economical to operate, quick to heat up, require no special skill and insure clean, bright, scale-free, dimensionally correct work. There is a size and model Sentry to meet your requirements.

Visit the Sentry Booth No. 543 at the Metal Show OCTOBER 18-24. See a Sentry Furnace in operation. Bring samples of your cutting tools for demonstration.

New 12-page, instructive catalog on request. Ask for bulletin 1054-F4.

The Sentry Company

FOXBORO, MASS., U.S.A.

Sentry DIAMOND Block

* Have you a job to put *these teeth* into?

If it's a tough job—one that won't take *second best* for an answer—here is why you should put these teeth into it.

They are built for the long grind in applications where severe loads occur and where space for bearing support is so limited that maintenance of exact pinion adjustment may be impractical.

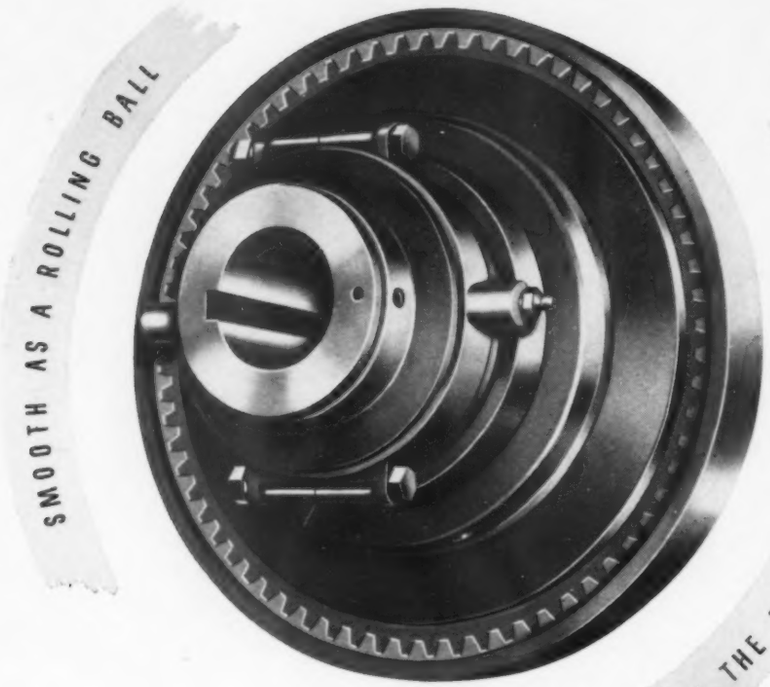
The physical and metallurgical rightness of these gears actually begins long before the teeth take final shape. To be exact, it begins with the first decision that straight tooth bevel gears are *right* for the job. And it ends with *specifications met or exceeded* on every set we make. Each step of the way from blank to final testing, the integrity of the Double Diamond mark is upheld.

The accumulated wisdom of over 25 years of gear manufacture—to *one* set of standards—is promptly available. A note on your letterhead will place our engineering department *at your service*. Write.

DOUBLE DIAMOND
TRADE MARK
GEARS

Made by
AUTOMOTIVE GEAR WORKS, INC.
RICHMOND, INDIANA

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS



We left the toggles out--

and made a better clutch

To simplify means to improve. Again Dodge engineering "know-how" has applied basic principles to make a *great* improvement—the Rolling Grip Clutch. A circle of hardened steel balls, forced into a wedge-shaped groove by a sliding cam, develops the power-transmitting pressure on the friction disc. Cam and groove contours use the principle of the wedge to multiply the force exerted on the shifter collar into a much greater force on the friction disc.

Dodge Rolling Grip Clutches give outstanding flexibility and ease of control without any sacrifice of positive drive. Rugged, compact, easy to adjust and low in cost, this new Clutch is suited to a wide range of applications requiring from 1/2 H. P. to 20 H. P. at 100 R. P. M. Get the details now about this and other new developments by Dodge of Mishawaka to help you cut costs and increase production.

DODGE MANUFACTURING CORPORATION • MISHAWAKA, INDIANA

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER

He's a factory-trained specialist in the mechanical transmission of power, qualified to analyze your problems and suggest correct equipment. A talk with him will mean savings to you. Look for his name under "Power Transmission Equipment" in your classified telephone directory.

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NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, ETCHING COMPANY OF AMERICA, 1520 MONTANA STREET, CHICAGO 14, ILLINOIS

FREE LITERATURE

New Catalogs, Booklets, Bulletins

(Not good after December 1, 1947)

MACHINES AND ATTACHMENTS

1 PRESS BRAKES—The Cyril Bath Co., Cleveland 8, Ohio. 40-page catalog describes Sturdybender power press brakes in capacities from 60 to 120 ton. Covers construction specifications, auxiliaries, and also illustrates case- and cabinet-forming machinery.

2 GRINDING SPINDLES — Ex-Cell-O Corp., Detroit 6, Mich. 80-page catalog lists grinding spindles, spindle brackets and quills. Gives information on application to grinders new and old. Drawings and charts show pertinent dimensions.

3 DIE SINKERS—Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn. 12-page circular 485 describes Nos. 2B and 3B plain and universal die sinkers. Universal machines can take cherrying cuts using standard die-sinking cutters and require no attachments for this purpose.

4 LATHES—Atlas Press Co., Kalamazoo, Mich. 12-page catalog L47 on 10-in. quick-change lathe which has 16 speeds, 54 threads or feeds. Four pages describe tools and accessories for the unit.

5 EXTRUSION TAKEUP — Industrial Ovens, Inc., Cleveland 11, Ohio. 12-page brochure, "Blueprint for Industry, Part IV," describes and illustrates developments in continuous extrusion takeup equipment, such as for production of thermoplastic-insulated wire.

6 GRINDING MACHINES — Cincinnati Grinders, Inc., Cincinnati 9, Ohio. 30-page bulletin G-566 covers 6- and 10-in. L plain hydraulic grinding machines. Units can be used for toolroom and production work, for traverse and infeed grinding.

7 THREAD GRINDING—Norton Co., Worcester 6, Mass. 36-page handbook for operators of thread-grinding machines includes information on mounting, dressing, speeds, coolant, types of wheels for various types of threads, methods of grinding.

TOOLS AND ACCESSORIES

8 GRINDING WHEELS — Grinding Wheel Manufacturers Association, Worcester 8, Mass. 84-page manual, "Grinding Wheels, Simplified Practice Recommendation," includes all data in official 1947 Government edition. Consists of two parts in which wheels are classified by shapes and by basic uses.

9 WRENCHES—Blackhawk Mfg. Co., Milwaukee 1, Wis. 36-page catalog 247 lists socket, box-type and open-end wrenches and sets. Includes new "Nugget" double-duty drive socket wrenches.

10 COUNTING DEVICES—Production Instrument Co., Chicago 5, Ill. 8-page bulletin 51 on counting, timing and recording devices including stroke and revolution counters, counter-actuating switches, time totalizer, and coil-winding and predetermined counters.

11 BALANCING—R. B. Annis Co., Indianapolis, Ind. 4-page bulletin describes Model M1 Dynograph dynamic-balancing machine made in six sizes with swing from 4½ to 16 in. It is an electronic device for locating and measuring separate components of dynamic unbalance.

12 RETAINERS, PUNCHES—Whitman & Barnes, Detroit 16, Mich. 24-page catalog 99 on Hercules retainers and interchangeable punches. Describes principles of Hercules system, gives specifications and prices.

13 MOUNTED WHEELS—The Carborundum Co., Niagara Falls, N. Y. 36-page handbook on mounted wheels and related abrasive products. Photographs and diagrams aid in proper selection. Describes methods for use with light portable grinding equipment.

14 FACE-MILLING CUTTERS—Kearney & Trecker Corp., Milwaukee 14, Wis. 20-page catalog C11 describes and tells how to select and use CSM face-milling cutters from 4- to 16-in. dia. Gives examples of typical milling operations.

15 PROFILOMETER — Physicists Research Co., Ann Arbor, Mich. 6-page bulletin tells how to set up surface-roughness specification and control system. Describes Profilometer and tells how it is used.

16 PHOTOELECTRIC UNITS — The Autotron Co., Danville, Ill. Four 2-page bulletins describe Shadowswitch miniature photoelectric unit; Shadowcount for production counting; and Shadowcontrol and Shadowmaster for counting and control.

17 CARBIDE TOOLS — Carboloy Co., Inc., Detroit 32, Mich. 16-page supplement to general catalog GT-175R lists new products, specifications and price changes. Includes solid boring tools and bars, threading tools, masonry drills, Carboloy-tipped centers.

18 ROTARY FILES—The Grobet File Co. of America, New York, N. Y. 16-page booklet illustrates and lists rotary files such as ball, oval, cylindrical-tree, cone, inverted-cone, and other shapes. Includes jeweler's and diesinking rotary files, countersinks, tube-deburring reamers.

19 GAGES, CARBIDE TOOLS—Metro Tool & Gage Co., Chicago 30, Ill. 40-page catalog 104 describes and illustrates gages and carbide-tipped tools. Includes various types of plug and ring gages, surface plates, reamers, centers, standard carbide tools.

20 HARDNESS TESTERS — Ames Precision Machine Works, Waltham, Mass. 12-page bulletin on lightweight hard-

Example

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FREE LITERATURE

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ness testers which read directly in Rockwell hardness. Round and flat stock, tubing, wire and odd-shaped pieces can be tested.

21 COUNTING DEVICES — Veeder-Root, Inc., Hartford 2, Conn. 112-page catalog G-47 describes and illustrates all standard and non-standard counting devices made by firm. Devotes section to typical applications. 10-page price list also available.

HEAT-TREATING AND WELDING

22 WELDING MACHINE — Niagara Machine & Tool Works, Buffalo 11, N. Y. 12-page bulletin describes electronic automatic welding machine. Unit has track permitting it to weld work parallel to track that is 10 ft. 1 in. wide and with maximum length governed only by track length.

23 ELECTRODES — The McKay Co., Pittsburgh 22, Pa. Catalog presents line of shielded-arc electrodes for welding of mild steels and alloy steels. Includes glossary of terms, résumé of welding faults and their prevention.

24 SPOT, PROJECTION WELDING —Progressive Welder Co., Detroit 12, Mich. 12-page bulletin 603 covers line of press-type spot and projection welders. Units are available in ratings from 50 to 500 kva.

25 INDUCTION HEATING — Ajax Electrothermic Corp., Trenton 5, N. J. 12-page bulletin 13-A gives information on forging, upsetting, spinning, hardening with Ajax-Northrup induction heating. Includes data on furnace controls, types of heaters.

26 THERMOCOUPLES — Arklay S. Richards Co., Inc., Newton Highlands 61, Mass. 16-page catalog 4 describes line of standardized industrial thermocouples with their parts, assemblies and accessories.

PLANT SERVICE EQUIPMENT

27 MARKING MACHINES — Adolph Gottscho, Inc., New York 13, N. Y. 4-page bulletin describes 22 industrial marking and coding machines. Illustrates each machine and gives explanations and applications.

28 CHAIN HOISTS — Whiting Corp., Harvey, Ill. 8-page bulletin H-100-A describes new line of electric chain hoists. Analyzes need for hoists, describes operation, gives specifications.

29 CRANE CONTROLS—Westinghouse Electric Corp., Pittsburgh 30, Pa. 20-page booklet covers five types of ac. magnetic crane controls for handling any type of load. Includes wiring diagrams, performance curves and application guide.

30 GRAVITY CONVEYORS — The Rapids-Standard Co., Inc., Grand Rapids 2, Mich. 24-page catalog describes and illustrates company's entire line of gravity conveyors. Groups together Rapid-Wheel and Rapid-Roller lines; includes complete listing of accessories.

PARTS AND MATERIALS

31 GEARS—Quaker City Gear Works, Inc., Philadelphia, Pa. 24-page catalog on precision gears for industry. Describes and illustrates various types, and includes several pages of tables of gear-tooth parts, formulas, circular pitch.

32 TENITE—Tennessee Eastman Corp., Kingsport, Tenn. 32-page fifth edition of "Tenite" describes the material, which is a cellulose ester thermoplastic. Includes 100 illustrations of products, many in color. Gives properties, uses.

33 POSITION INDICATING — General Electric Co, Schenectady, N. Y. 20-page booklet gives application data on dc. selsyn three-wire system indicators and transmitters. Outlines principle of operation.

34 NICKEL ALLOY — The International Nickel Co., Inc., New York 5, N. Y. 36-page booklet gives properties and performance data on Ni-Resist, a cast nickel alloy. Includes 13 pages of tables on corrosion data for 400 corrosive media.

35 LEATHER BELTING—J. E. Rhoads and Sons, Philadelphia 6, Pa. 24-page handbook gives engineering data for design and installation of Tannate leather belting for Rockwood short-center pivoted-motor-base drives.

36 TOOL STEELS—Allegheny Ludlum Steel Corp., Pittsburgh 22, Pa. 72-page catalog lists tool and high-speed steel warehouse stocks. Indicates types, shapes and sizes. Shows exact location of each item in stock so that buyer can determine nearest source of supply.

37 CONTROLLERS — The Brown Instrument Co., Div., Minneapolis-Honeywell Regulator Co., Philadelphia 44, Pa. 40-page catalog. "Air-Operated Controllers," describes control instruments for temperature, pressure, flow, liquid level and humidity.

38 POWDERED METAL—The United States Graphite Co., Saginaw, Mich. 260-page catalog describes Gramix powdered metal. Gives general description of powdered-metal parts manufacture, and includes discussion of characteristics, sketches of bearing assemblies, tables on dimensional limits. Major portion devoted to progressive size listings of dies available for producing Gramix parts.

39 COUPLINGS—Roylyn, Inc., Glendale 3, Calif. 20-page catalog contains engineering data and specifications on quick couplings, caps and allied products available to manufacturers and users.

40 CLUTCHES, BRAKES — Stearns Magnetic Mfg. Co., Milwaukee 4, Wis. 20-page catalog 266 on magnetic clutches and clutch-brake units. Includes torque formulas, applications, specifications.

41 STEEL PLATE—Joseph T. Ryerson & Son, Inc., Chicago 80, Ill. 8-page bulletin on special type of high-sulpher-analysis steel plate for applications involving machining such as production of machine parts, die bases, jigs and fixtures.

42 METAL HOSE—Chicago Metal Hose Corp., Maywood, Ill. 68-page catalog G-47 on flexible metal hose covers Rex-Weld corrugated, Rex-Tube convoluted, and Rex-Flex stainless-steel types. Also describes stainless-steel bellows.

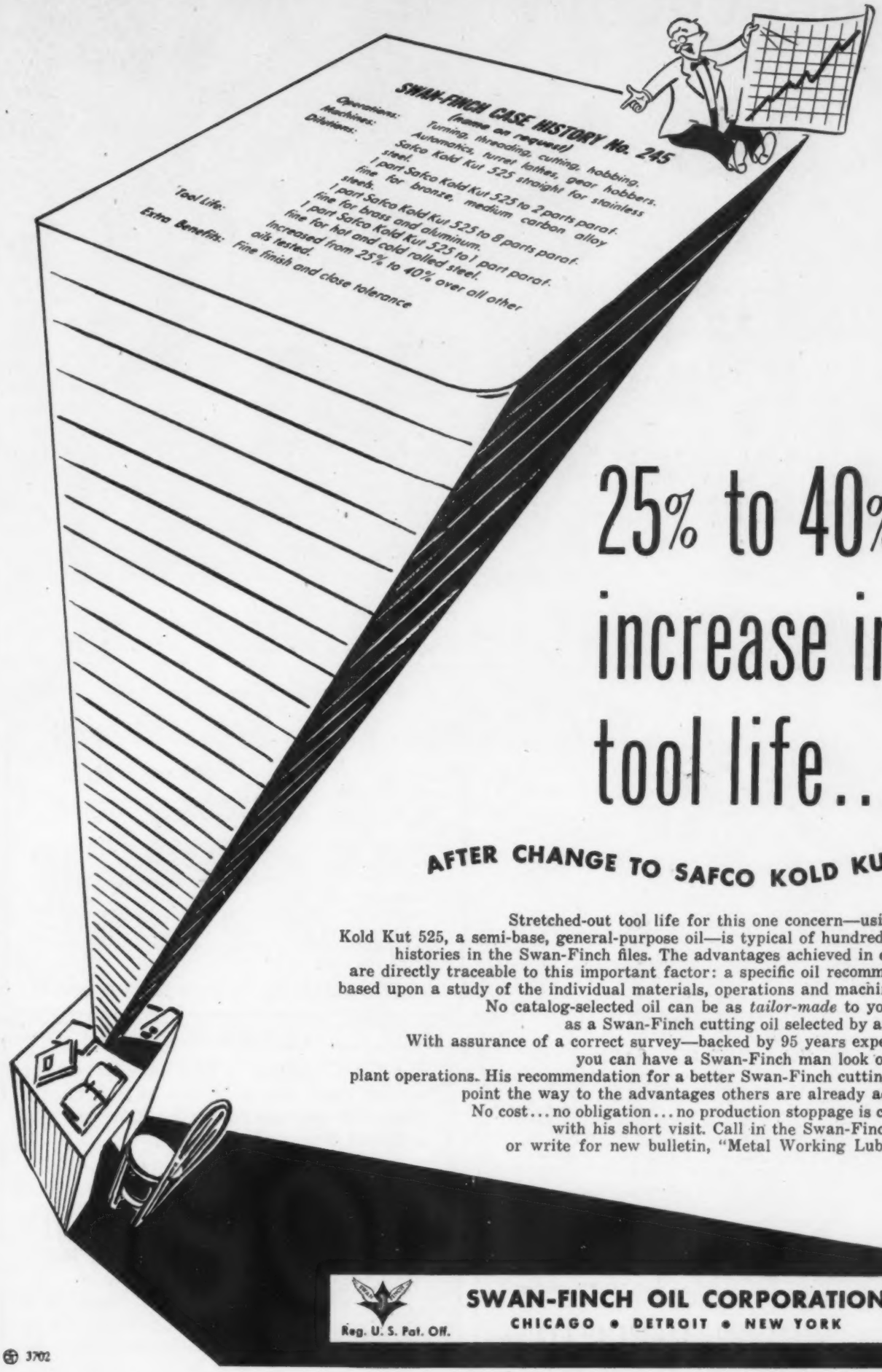
43 PLASTIC KNOBS — Kurz-Kasch, Inc., Dayton, Ohio. 14-page catalog 103A describes, illustrates and gives dimensions of plastic knobs, dials and control balls. Includes instrument, pointer and control knobs.

44 SQUARE D—Square D Co., Detroit 11, Mich. 76-page catalog gives current prices, new developments and general information on firm's products. New designs include circuit breakers and various types of panelboards.

45 ALLOYS—Driver-Harris Co., Harrison, N. J. 72-page catalog R-46 describes Nichrome, Chromax, Advance and other high-nickel electrical heat- and corrosion-resisting alloys produced by the firm. Tables and charts are used to present most of the information.

MISCELLANEOUS

46 PRODUCTS OF EATON — Eaton Mfg. Co., Cleveland 10, Ohio. 42-page booklet illustrates products of firm such as axles, valves, rotor pumps, drawn steel, castings, and snap rings. Includes new products such as dynamometers, vehicle fan drives.


SWAN-FINCH CASE HISTORY No. 245
(name on request)
Operations: Turning, threading, cutting, hobbing.
Machines: Automatics, turret lathes, gear hobbers.
Dilutions: Safco Kold Kut 525 straight for stainless steel.
1 part Safco Kold Kut 525 to 2 parts parat-fine for bronze, medium carbon alloy steels.
1 part Safco Kold Kut 525 to 8 parts parat-fine for brass and aluminum.
1 part Safco Kold Kut 525 to 1 part parat-fine for hot and cold rolled steel.
Tool Life: Increased from 25% to 40% over all other oils tested.
Extra Benefits: Fine finish and close tolerance

25% to 40% increase in tool life...

AFTER CHANGE TO SAFCO KOLD KUT 525

Stretched-out tool life for this one concern—using Safco Kold Kut 525, a semi-base, general-purpose oil—is typical of hundreds of case histories in the Swan-Finch files. The advantages achieved in each case are directly traceable to this important factor: a specific oil recommendation based upon a study of the individual materials, operations and machines used. No catalog-selected oil can be as *tailor-made* to your needs as a Swan-Finch cutting oil selected by an expert. With assurance of a correct survey—backed by 95 years experience—you can have a Swan-Finch man look over *your* plant operations. His recommendation for a better Swan-Finch cutting oil will point the way to the advantages others are already achieving. No cost... no obligation... no production stoppage is connected with his short visit. Call in the Swan-Finch expert or write for new bulletin, "Metal Working Lubricants".

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THE WORLD'S FINEST
MULTIPLE SPINDLE
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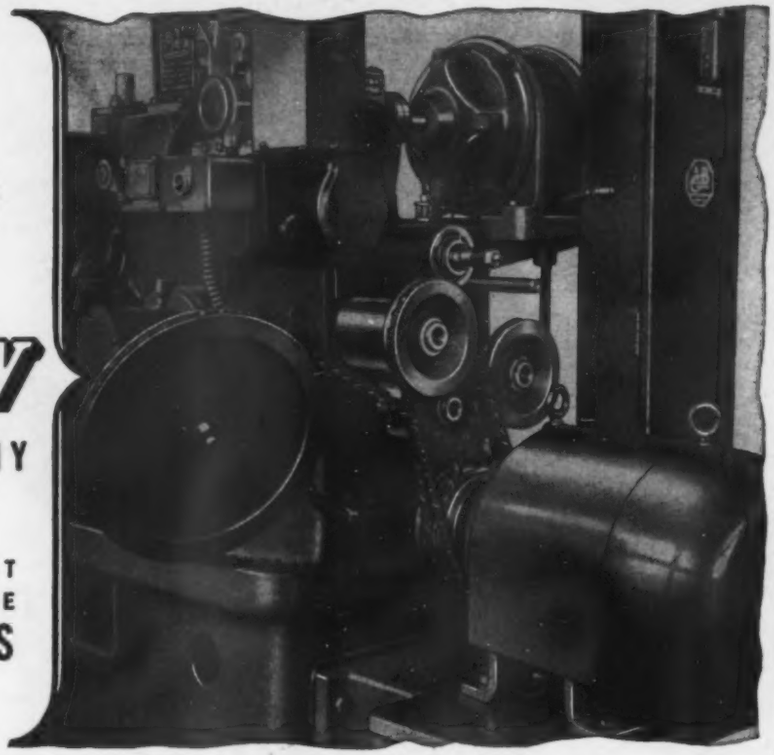


SHELDON

TRB S-56 PRECISION LATHES

TOMORROW'S LATHE FOR SALE TODAY

Just as the S-56 (famous as the wartime's mobile shop and instrument lathe) was well ahead of its time, the new TRB S-56 is definitely a "lathe of tomorrow."

Added to its previous advantages . . . to the same rigid 56" bed, 4-speed V-belt drive with double V belts to spindle, its 1" collet capacity, 1¾" hole through spindle, and modern 3-drawer steel bench are: a new heavier headstock with large tapered roller bearings and a higher speed range, and increased capacity for heavy work.

The new bearings are not just anti-friction but are "Zero Precision"—the absolutely finest taper roller bearings built.

This is more than incidental improvement . . . it means that every Sheldon TRB S-56 can do accurate precision work, at new high machining speed and maintain its extreme accuracy—can produce more and at lower cost per piece.

Write for new TRB S-56 catalog sheet

From any angle this "tomorrow's lathe" is your best buy today.

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

4234 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U.S.A.

Put Your Stop Watch

on NICHOLSON

EXPANDING MANDRELS

Test the time-saving possibilities of these widely used precision tools. Not infrequently time studies show operations can be completed in less time than was formerly consumed in looking for or turning a solid arbor. No parts to wear out and cause distortion. Sold singly or in sets; for bores ½" to 7". Bulletin 1043.

W. H. NICHOLSON & CO., 114 Oregon St., Wilkes-Barre, Pa.

HARDNESS TESTER

The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE

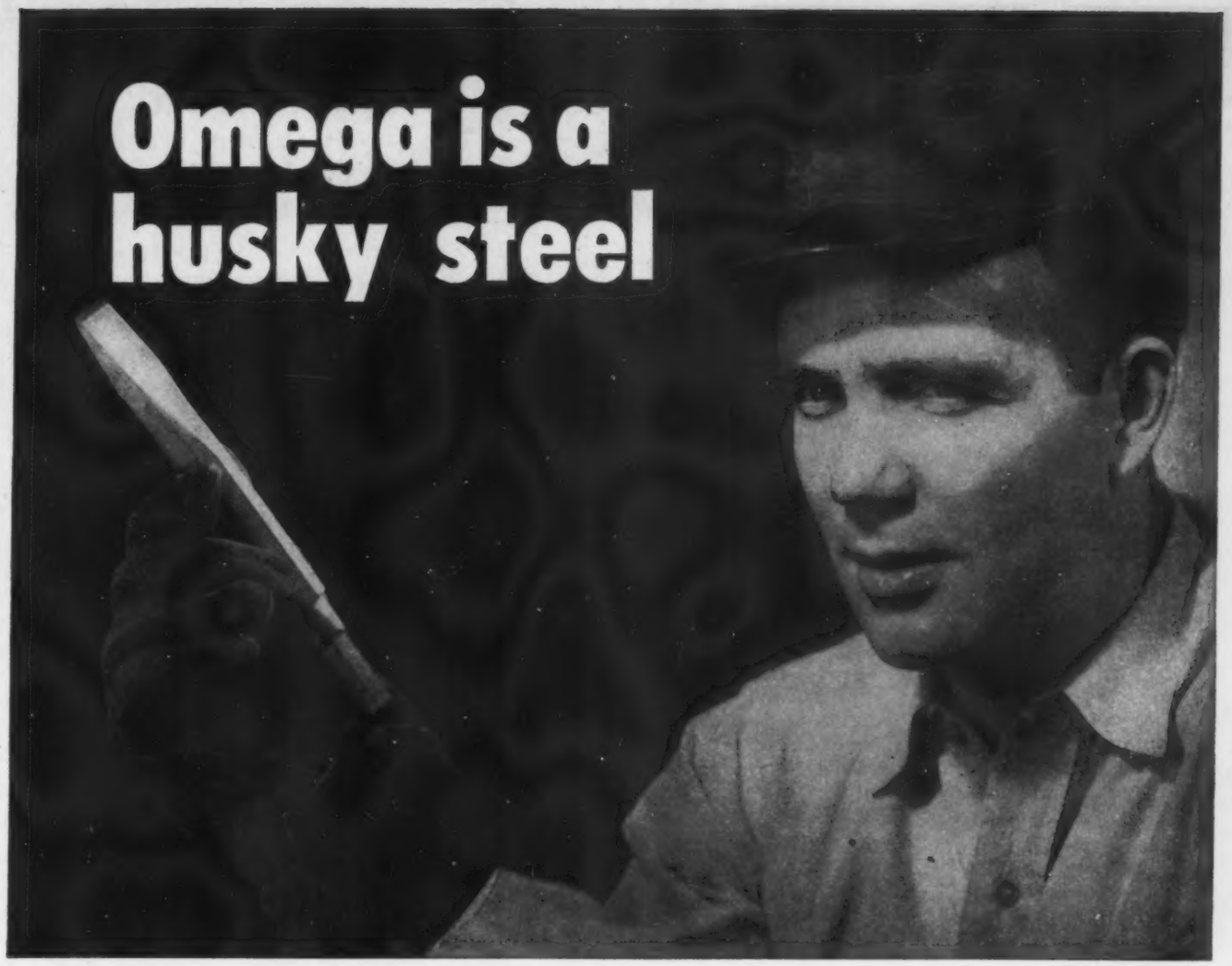
Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.

9025 VAN WYCK AVENUE
JAMAICA, NEW YORK

TELEPHONE: JAMAICA 6-4070

Omega is a husky steel



Here's a tool steel that thrives on cold-battering jobs. Omega keeps a sharp cutting edge and takes hard knocks in its stride. It's super-resistant to shock. That's why it's popular for applications like these:

Chipping chisels	Beading tools
Shear blades	Punches
Calking tools	Forming rolls
Rivet busters	Swaging dies

When the job calls for drastic, repeated impacts at normal temperature, Omega is your best choice. It is essentially a silico-manganese steel, combining ductility, high tensile strength, and hardness. Give it a trial—as rough as you want. You'll like the way Omega stands up.

The nearest Bethlehem district office or tool-steel distributor can give you complete details.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem Products are sold by Bethlehem Pacific Coast Steel Corporation

QUICK FACTS ABOUT OMEGA

- **Harden it in either oil or water.**
- **Easy to forge, machine, heat-treat.**
- **58-60 Rockwell C normal working hardness.**
- **In its maximum heat-treated condition, its resistance to impact, using Charpy unnotched specimen, is approximately 130 foot-pounds.**
- **Typical Analysis:**

C	Mn	Si	V	Mo
0.60	0.70	1.85	0.20	0.45

BETHLEHEM STEEL

***OMEGA*... one of Bethlehem's Fine Tool Steels**

HOW TO SELECT *the Right* UNIVERSAL JOINT

Universal joints perform various functions in a wide variety of applications — from heavy duty power transmission to high or low speed light duty installations. Selection of the *right* joint for the job is important.

Either the Curtis Standard — available in 14 sizes, from 3/8" O.D. to 4" O.D., single or double — or the *new* Curtis Ball-Type in 4 sizes, from 1/2" O.D. to 1-1/4" O.D., will enable you to specify the correct size and strength of joint to secure the most economical and trouble-free installation.

For heavy-duty jobs specify Curtis Standard Joints — made of alloy steel throughout with each part heat treated and ground for maximum strength, long life and accuracy.

For light-duty work specify Curtis Ball-Type Joints — with bronze center ball and steel forks with center pins of heat treated, centerless ground steel.

Select the RIGHT joint for your particular purpose from the data shown below —

Cat. No.	Type	O. D.	Overall Length	Breaking Loads: Static Torque in. lbs.	Breaking Loads: Tensile Load Pounds
C-642	Std.	1/2"	2"	340	1000
CS-42	Ball	1/2"	2"	170	720
C-644	Std.	3/4"	2-11/16"	1300	2800
CS-44	Ball	3/4"	2-11/16"	650	2000
C-646	Std.	1"	3-3/8"	2500	5150
CS-46	Ball	1"	3-3/8"	1250	3600
C-648	Std.	1 1/4"	3-3/4"	5000	7200
CS-48	Ball	1 1/4"	3-3/4"	2500	4950

All Curtis Joints can be furnished with hubs machined to your specifications. Drawings should accompany inquiry if possible.

For complete engineering data and drafting templates write Dept. B-3

CURTIS UNIVERSAL JOINT CO. INC. SPRINGFIELD MASS.

LATEST MACHINE TOOLS FROM BRITAIN!

Ten Ton Horizontal Press with Dial Feed & Automatic Ejecting Mechanism

Vertical Presses up to 500 Tons Capacity.

Radius Attachment for Grinding or Milling
All Types of Turning or Milling Tools
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Precision Centering Machines
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Welding Machines
All Types of Mechanical Gauges
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For further information write:

BRITISH MACHINE TOOLS (Export) Ltd.

367 Diamond Bridge Ave., Hawthorne, N. J.

Telephone: HAwthorne 7-2810

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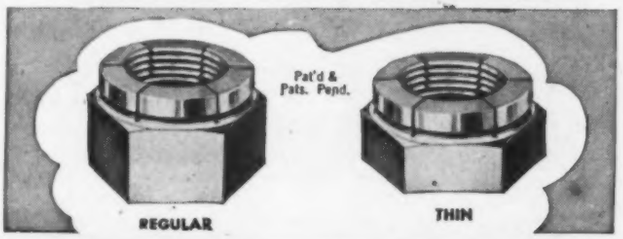

FLEXLOC

SELF-LOCKING NUTS

"Flexloc" is of one-piece all-metal construction, available in U.S.S. and S.A.E. thread series. Every thread of the "Flexloc"—including the locking threads—takes its share of the load, and the torque is unusually uniform because it is controlled. "Flexloc" accommodates itself to a wide range of tolerances . . . can be used over and over again, without losing much of its locking torque . . . is not affected by temperatures likely to be met within the field of Mechanical Engineering . . . being a "stop" nut, it *stays locked* in any position on the threaded member.

It is made by the manufacturers of the unexcelled "Unbrako" Socket Screw Products—guaranteeing quality. Sizes from #6 to 1" in diameter—in both "regular" and "thin" types (shown above).

Millions of Flexlocs now in use.

OVER 44 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PA. BOX 4

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This NEW Veelos Catalog is Crammed with V-Belt Benefits for You

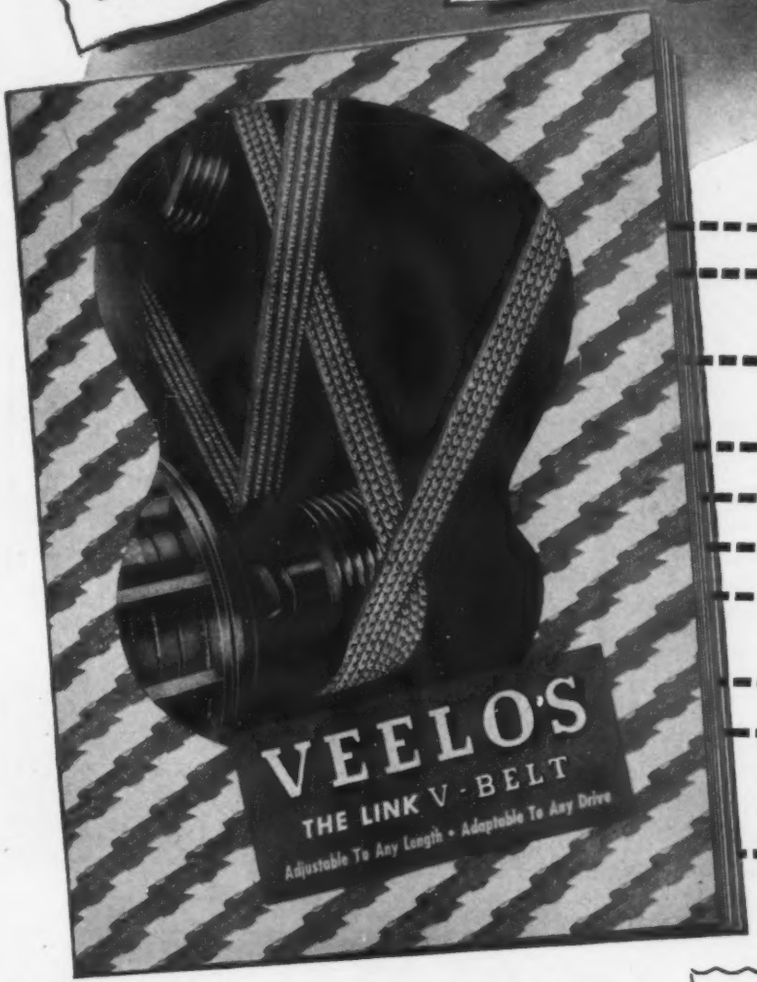
Here are just a few...

Insurance Against Shutdowns
Belt replacements for any length drive are always available from a reel of Veelos.

Expensive Belt Inventories Ended
Four reels of Veelos replace up to 316 sizes of endless V-Belts. Veelos takes up only trifling storage space . . . simplifies stock records.

Costs Far Less to Install
Belts are quickly uncoupled, made endless and installed. Installation savings run as high as 9/10 the cost of installing endless belts.

Easy Adjustability
Uniform tension maintained just by removing one or more links. On fixed center drives, slide rails and pivoted motor bases are not needed.



14 Important Advantages *(Page 2)*

Four Reels replace up to 316 Sizes of Endless V-Belts *(Page 3)*

Two Types Cover All Drive Requirements *(Page 5)*

Special Applications *(Page 5)*

Construction *(Page 6)*

How to Measure *(Pages 7 and 9)*

How to Couple and Uncouple *(Page 8)*

How to Install *(Page 9)*

Engineering Data: Selection and Length Tables, HP Ratings, etc. *(Pages 10 and 11)*

Installation Photos of Veelos at Work in a Wide Variety of Industries *(Pages 12 to 24)*

Clip Coupon *for Veelos catalog. The edition is limited but there's a copy for you.*

It's FREE

THIS fact-packed catalog describes in detail 14 distinct advantages of Veelos, the link V-belt. It shows Veelos in action on drives in a wide variety of industries. You will find easy-to-read instructions, applications, installations, engineering data. Send coupon for the book that will bring many benefits to your plant.

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Veelos—Known as VEELINK outside the United States

ATTAINS 1650° F. QUICKLY
Atmospheric Pot Hardening Furnace

"BUZZER" HIGH SPEED *Gas* FURNACES

. . . are the efficient, economical answer to today's Heat Treating Problems. **NO BLOWER or OTHER AUXILIARY POWER are needed . . . just connect to your gas supply.**

- The Full Muffle Furnace attains a temperature of 2400° F., and The Pot Hardening Furnace, tangentially fired, assures quick even heat up 1650° F. Many other models available.
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No. 1G	INTERNAL GRINDER	No. 34	VERTICAL SPINDLE SURFACE GRINDER
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Patented Cutting Off Blades

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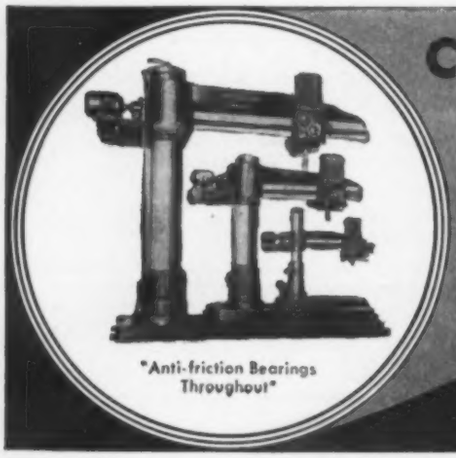

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CINCINNATI 25, OHIO, U. S. A.

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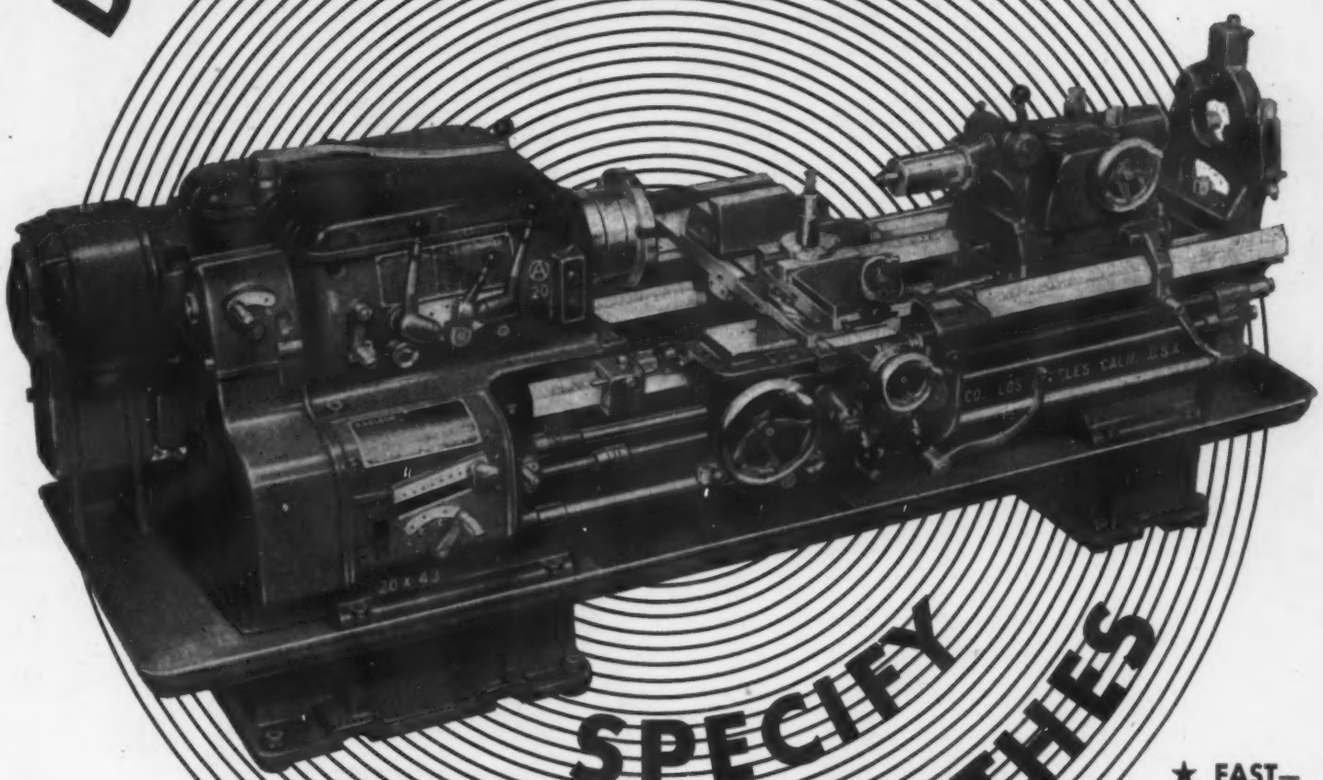

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Axelson Lathes, of various lengths, are manufactured in 14, 16, 18, 20, 25 and 32-inch sizes.

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THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

DEPENDABLE FOR OVER A QUARTER CENTURY

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Adjustable MULTIPLE SPINDLE DRILL HEAD

Fits any machine.
Head can be furnished with 2 to 10 spindles, saving 2 to 10 Operations.
Standard Spindle No. 1 M. T. Spindle Capacity 1/2 drill in Cast Iron Standard.
Special adaptation 3/4 in cast iron.
A "Big Brother" to Our 1/4 Capacity Head.

10" drilling area

PRICES			
3 Spindle Head	$177.	7 Spindle Head	$285.
4 Spindle Head	204.	8 Spindle Head	312.
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Delivery in Two Weeks

Also manufacturers of all types of fixed center heads.

US HEADS SINCE 1915

WRITE TODAY For descriptive catalog.

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MECHANICAL MUSCLES

FOR EVERY LIFTING AND CARRYING JOB

Install PORTELVATOR. The Hamilton portable elevating table. One man can safely lift and carry loads previously requiring the strength of four.

Raises, lowers, transports. Three table surfaces. Accessible from four sides. Four point support. Standard model capacities, 1,000 to 5,000 pounds. Special models built on order.

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Famous for

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- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

H&G DIE HEAD

See our Advt. on Page 29, Oct. 9, '47 American Machinist

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.
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REMEMBER, top quality uniform shirts start with top quality shirting. To be sure you get the best, specify Glengarrie Poplin . . . every phase of manufacture takes place in Reeves own mills and finishing plant.

Glengarrie Poplin is a fine, high-count, combed yarn shirting. It's Sanforized* and its vat dyed colors are fast to sun, water and perspiration.

It saves you money and guarantees that your shirts will still look smart after continued wear and washing. Demand Glengarrie Poplin for shirts that are *right* on the job.

**Residual shrinkage less than 1%.*

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WEAR RESISTANT

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Lowest friction coefficient. The high polish burnishes rather than wears mating parts. Can be run dry at high speeds to 3000° F. Used in precision grinders and production equipment as well as instruments. Sleeve bearing sizes .003 to .500. Outperforms "frictionless" bearings.

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- LONG WEARING
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Now available for guides, wear strips, back stops, non-wearing surfaces. Assemble in your own plant by cementing, shrinking or metal bonding. Special shapes made to your specifications.

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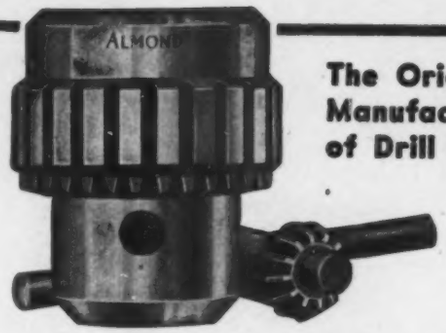
Almond Drill Chuck



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. . . for over 70 years

ALMOND THREE-JAW DRILL CHUCKS—the first to be placed on the market more than seventy years ago—pioneered the field of drill chucks. During all these many years, ALMOND CHUCKS have continued to be a necessary part in the logical procedure of machine developments.

Made in types and sizes to fit all machine tools and portable drills.

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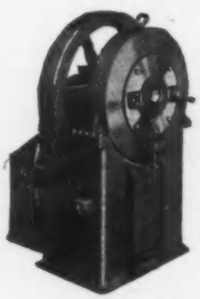

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SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

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ERRINGTON MECHANICAL LABORATORY

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TAPPING CHUCKS

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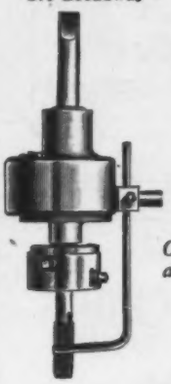
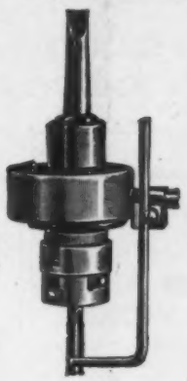


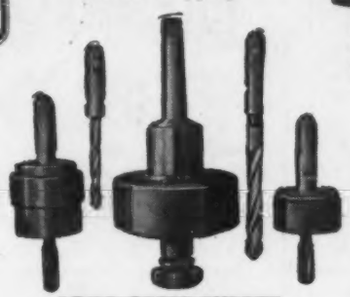
Size	Taps Exact Size
No. 00 H.S.	Up to ¼"
" 00	⅛" ⅛"
" 0	3/16" ½"
" 1	5/16" ¾"
" 2	7/16" 1 "
" 3	5/8" 1¼"
" 4	¾" 1½"
" 5	¾" 2 "

CHICAGO
6701 N. Sioux Ave.



Our High Speed Tappers are Super-Sensitive for Small Tapping

Style B Positive Stop Holds Work Down



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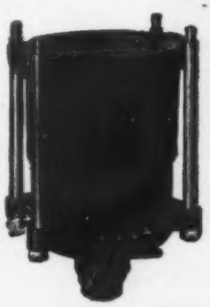
DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tapholder. If required.

Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

DIECUSHIONS THAT MODERNIZE YOUR DIE CONSTRUCTION AND DESIGN



ADAPTABLE TO ALL DEEP DRAWING PRESS OPERATIONS.

Self-contained unit, quickly installed on any punch press.

Can be used to advantage on pressure pad controls on all forming dies.

DIE CUSHION PISTON DIAMETER						
5"	6"	8"	10"	12"	14"	16"
MAXIMUM DRAW						
2"	2½"	3"	3"	3"	4"	5"
DRAW RING HOLDING PRESSURE (in tons)						
.9	1.4	2.5	3.9	5.7	7.7	10.0

Write for Catalog No. 100-1

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Manufacturing Company
MINNEAPOLIS 7, MINNESOTA

Craftsmen of the Production Line . . .

choose *haskins* FIRST!

■ Good tools make *any* job easier—make any man a better craftsman. That's why Haskins portable flexible shaft tools are so often the choice of skilled production line men. They *know* tools: and they know that Haskins machines will simplify *all* their work—buffing, grinding, polishing, drum and disc sanding.

Whether your problem is finishing die castings or fabricating with stainless steel, Haskins tools can help you get improved craftsmanship in *your* shop.

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HASKINS

HS-4; *widely used in fabrication of all steels; ½ h.p. multi-speed, countershaft unit, 1500 to 7800 R.P.M., mounted bench height on caster base, 360° swivel. One of many models.*

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TOOLS • DIES • JIGS • FIXTURES • MOLDS • STAMPINGS • FORGINGS • SPECIAL MACHINERY • DEVICES • PARTS • SCREW MACHINE PRODUCTS • CASTINGS

FLAME CUTTING
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Machine frames and bases, gears, flywheels, pulleys, special shapes.

FOUNDRY — MACHINE SHOP
With facilities for normalizing and sandblasting.

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Send prints for quotation

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WANTED
PRODUCTION AND CONTRACT WORK

for Heavy Duty Equipment; Turret Lathes, Heavy Duty Lathes, Vertical and Horizontal Boring Mills, Drill Presses, Box and Open Side Planers, Welding and Fabricating Equipment.

Operating with low overhead, our quotations on your requirements for production or job contract will be very attractive.

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IDLE MACHINES COST YOU MONEY!

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Provide a steady flow of work for your plant through advertising your facilities and experience in this section—where it will be seen by more than 28,000 metalworking executives representing 90% of the purchasing power of the industry.

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For information on rates, write

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ACCURACY + ALL METALS + UNIFORMITY

Specialists
FOR OVER 50 YEARS
IN
Screw Machine Products
of 1/22" to 1 1/16" diameters

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SCREW COMPANY
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QUICK DELIVERY + ALL THREADS + DEPENDABILITY

SEND B.P. FOR
MFG. COMPLETE ASSEMBLIES
Tool—Jigs—Dies
Screw Machine and Turret Lathe Work
Stampings—Gears
POSSY'S TOOL & MFG. CO.
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PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Ruck Street Cincinnati, Ohio

SCREW MACHINE SPECIALISTS

- 1/32" to 1⅝" Dia. Cap.
- Brown & Sharpe Automatics Acme-Gridley Mutiple Spiadle Automatics
- Hand Screw Machines
- Equipped for All Secondary Operations
- Send Prints or Samples for Prompt Quotations

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1935 UNION RD.
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PRECISION MACHINE WORK
Mold plates, Cavity plates, Rubber molds, Hydraulic pump units and parts to specifications. Die plates for injection molding, Strain rods. Production work, turret lathe, exceptional Engine lathe operations, Milling & Drilling. Machines built to specifications. Prints will receive prompt quotations.
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SCREW MACHINE PRODUCTS
Multi Spindle ¼" to 2⅝" Diameter. Punch Presses to 50 Ton. Turret and Engine Lathes. All secondary operations. Drill Press, Riveting & Soldering, Packaging & Assembling.
Send us your prints or samples for quotations.
METOMIC CORP.
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CAPACITY AVAILABLE

Stampings, machine work, assemblies.

Well equipped tool room.

Competent engineering facilities.

Quotations promptly furnished.

BEMIS & CALL CO.
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TOOLS AND DIES
METAL STAMPINGS
Metal Parts Machined Completely.
Service Prompt—Prices Reasonable
NIAGARA METAL PRODUCTS CO.
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GEARS — SPROCKETS
Special Machinery
MEDIA MACHINE WORKS
Media Pennsylvania
Established 1922

SEARCHLIGHT SECTION

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60¢ per line, minimum 4 lines. To figure advance payment count 5 average words as a line.
POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.
PROPOSALS, 50 cents a line an insertion.

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BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

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NEW ADVERTISING received by 10 A. M. October 23rd will appear in the issue of November 6th subject to limitation of space available

WANTED GENERAL SUPERINTENDENT

Long established drop forge plant located in the East offers an unusual opportunity to an experienced, technically trained man of proved ability, who is thoroughly familiar with die design, heat treating, hammer and machine shop operations, estimating, etc.

Apply by letter, giving all details as to experience, references, and salary expected. If possible, include recent snapshot. All applications will be held in strictest confidence.

P-1980, AMERICAN MACHINIST
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Manufacturer of nationally distributed consumer products located in small central Ohio community has opportunity for qualified engineer for development and research assignments. Must be visionary, inventive and practical as well as tactful and cooperative. Write giving age, education, experience and personals including photograph, references, and salary desired. Replies will be confidential. Our organization knows of this offer.

P-2591, AMERICAN MACHINIST
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WORKS MANAGER — EXECUTIVE ENGINEER

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946.

Of American Machinist, published Bi-Weekly at New York, N. Y. for Oct. 1, 1947.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. A. Gerardi, who having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of American Machinist, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily, weekly, semiweekly or triweekly newspaper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), printed on the reverse of this form, to wit:

1. That the name and address of the publisher, editor, managing editor, and business manager is: Publisher, McGraw-Hill Publishing Company, Inc., 330 West 42nd St., New York 18, N. Y.; Editor, Burnham Finney, 330 West 42nd St., New York 18, N. Y.; Managing editor, E. J. Tangerman, 330 West 42nd St., New York 18, N. Y.; Business manager, W. E. Kennedy, 330 West 42nd St., New York 18, N. Y.

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J. A. GERARDI, Secretary

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(My commission expires March 30, 1948.)

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2—#4 Warner & Swasey Universal Turret Lathe, Motor Driven
16" Warner & Swasey Brass Lathe
#2A Warner & Swasey Universal
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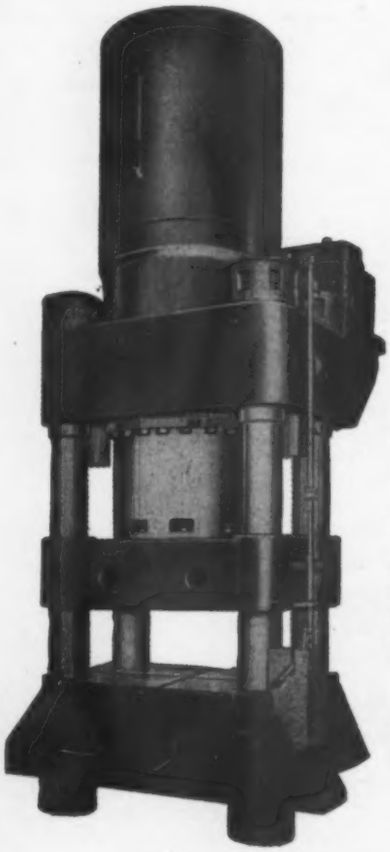

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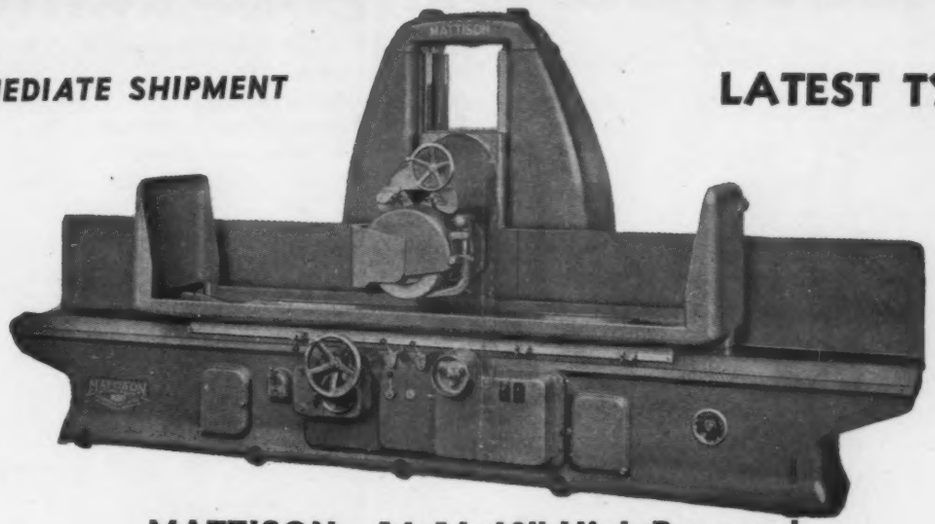

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BROACHES

LaPOINTE #3L, 4L, Horiz., hyd., latest type
LaPOINTE #SRV-25-66, 10-54, Vertical Surface, hyd., latest

DRILLS

AMERICAN 3'11" Hole Wizard Radial—Latest Type
CARLTON 6'15" Ball Bearing, Radial—M.D.
CARLTON 8'19" Radial—mounted on 32' runway—Latest Type
WESTERN 5'18", 6'20" Radial—Latest Type
NATCO B4A—Multiple Spindle, Hyd.—Latest Type
NATCO B4B—adj. Multiple Spindle—Hyd.—Latest
BAUSH #4—Adjustable Multiple Spindle—M.D.
NATCO Model D5—Adjustable Multiple Spindle—Latest

GEAR CUTTING EQUIPMENT

BROWN & SHARPE No. 3H gear cutter, M.D.
FELLOWS #64, 615A, 645A3, 7, 7A, 72, 75A, 77, High Speed Gear Shapers, latest type
GLEASON 12" Straight Bevel Generator, Latest Type
GOULD & EBERHARDT 12HS Hobber, latest
GOULD & EBERHARDT 36H, with diff., M.D.
NEWARK #5, 72" Hobber, Univ., Motor Drive
PRATT & WHITNEY 10" Grinder, hyd., latest
SCHUHARDT & SCHUTTE #1, #2 with diff., M.D.

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
BROWN & SHARPE #5 Plain, 3x12, Latest Type
LANDIS 4x18, Type H, hyd., latest type
LANDIS 6x18 Type "C", Hyd., Latest Type
LANDIS 30x220" Plain, Roll, Motor Drive
NORTON 16x72" Univ., Hyd., Type C, latest
NORTON 16x72" Plain Type "C", latest type

GRINDERS—Surface

ARTER 30" Rotary Surface—Hyd.—latest type
BLANCHARD #11—16" chuck, Latest Type
BLANCHARD #16—24" chuck, Motor Drive
BLANCHARD No. 16A—Dial Type—motor drive
BLANCHARD #27-18 M.D., Latest Type
GALLMEYER & LIVINGSTON #35, 8x24" Hyd., latest type
GALLMEYER & LIVINGSTON #55, 12x36", hyd., latest type
HEALD #22, 12" chuck, Rotary, latest type
NORTON 10x36 Hyd., Latest Type
NORTON 6"x18"—Hyd.—Latest Type
THOMPSON 8x12x24 Hyd., latest type
THOMPSON 16x30x48 Hyd., Latest Type

JIG BORER

PRATT & WHITNEY 2A, Motor Drive, Latest
PRATT & WHITNEY 3B, Motor Drive, latest

LATHES—Engine and Mfg.

BETTS BRIDGEFORD 60"x24' bed, swing 84"
BRIDGEFORD 36"x28', 36"x32' bed—2 car., M.D.
HENDEY 14x8' geared, Engine, M.D.
LEBLOND 13"x4', 17"x5', 17"x14' bed, Rapid Production, Timken Bearing, latest type
LODGE & SHIPLEY 16/20"x30" centers, Timken bearing, latest type
LOSWING 4x60, 4x84, 8x60, 8x108, 5x34" centers, Timken Bearing, latest type
MONARCH 36x108" Centers, Timken, latest type
MONARCH 12"x30" centers, Timken, Latest Type
NILES 42"x60", double head, motor drive
NILES 48x35' centers, Heavy Duty, 2 carriage, Timken Bearing, PRT, Latest Type
NILES 60x10', 35', 40' centers, 1 or 2 carriages, Timken Bearing, PRT, Latest Type
NILES 72"x32' centers, combination Boring and Turning, Motor Drive
NILES 30x50' Boring, Timken, Latest Type
REED PRENTICE 20x54" Centers, Timken, latest type
REED PRENTICE 27"x15', 20' centers, M.D.
WARD HAGGAS & SMITH 18/36"x10' bed, Gap

LATHES—Turret

CINCINNATI ACME No. 1, No. 5W, Latest
GISHOLT No. 3D Simplimatics—Timken—Latest
GISHOLT #3, 5, Univ., Timken, Latest
GISHOLT #1L, #2L, Universal, Timken, Latest
JONES & LAMSON #3, 7C, 8A, Universal, Timken Bearing, Latest Type
LIBBY 1H-5, 5½ hole, Timken, Latest
MOREY No. 2G, No. 3, No. 4, Timken, latest
WARNER & SWASEY 3A, Universal 6" bar capacity, Timken Bearing, Latest Type
WARNER & SWASEY #4, 5, Univ., Latest
WARNER & SWASEY #1A, 4A, Univ., Latest

MILLING MACHINES—Mfg.

CINCINNATI 3-24 Duplex Hydromatic, latest type
INGERSOLL 32x24x16' Planer Type, 2 heads, AC, M.D.
INGERSOLL 48x42x16' Planer Type, 4 heads, AC, M.D.
TAYLOR & FENN M-80 Duplex, Spline, latest type

MILLING MACHINES—Plain

BROWN & SHARPE #12 Timken Bearing, latest
CINCINNATI 1-12, 2-24 Timken, latest type
CINCINNATI 4-36 Hydromatic, latest type
CINCINNATI #2, #3 Dial Type, Timken, latest
CINCINNATI #4, 4S, 5, Timken Bearing, M.D.
CINCINNATI 0-8 Automatic rise and fall, Timken, Latest Type
KEARNEY & TRECKER #3K Timken, latest
KEMPSMITH #2, Model G, Timken, Latest
KEMPSMITH No. 4 Maximiller—Timken—latest

MILLING MACHINES—Vertical

CINCINNATI #2, 3, 4, Dial Type, Timken, latest type
CINCINNATI No. 3, No. 4 High-Powered, M.D.
KEARNEY & TRECKER #2K, 3K, Timken, latest type
REED & PRENTICE 3VG with or without Hydraulic Duplicator, Timken Bearing, latest type

MISCELLANEOUS

BARNES #172, 249 Vertical Hone, Latest
DoALL ML 16, V-36, Saw—Latest Type
FERRACUTE DG-55, 75 ton Drawing Press, Tie Rod, 17" stroke, Latest Type
LANDIS 1" Bolt Threader—Latest Type
PRATT & WHITNEY "Keller" Type G, Type BL2416—Latest Type

PLANERS

CHANDLER 36x36x20', 4 heads, AC, M.D.
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
DETRICK & HARVEY 84x84x18', 4 heads, DC, M.D.
LIBERTY 24x24x8', 2 heads, AC, VARI-VOLTAGE, latest type
NILES BEMENT POND 48x48x16', 2 heads, AC, M.D.
OHIO 42x42x20'—2 heads, AC, M.D.
ROCKFORD 24x24x66", 3 heads, hyd., latest

SHAPERS

CINCINNATI 20" High speed, latest type
GOULD & EBERHARDT 24" High Duty, M.D.
LAMAIRE 18' Vert. Hydraulic—latest type
LYND FARQUHAR 26" Openside, Motor Drive
MOREY 8", 10", 12", 14" Vertical, latest type
MORTON 48", Draw Cut, Motor Drive
PRATT & WHITNEY 6' 10" Vertical, M.D.
ROCKFORD 36" Openside, hyd., latest type
SMITH & MILES 25" Heavy Duty, latest type

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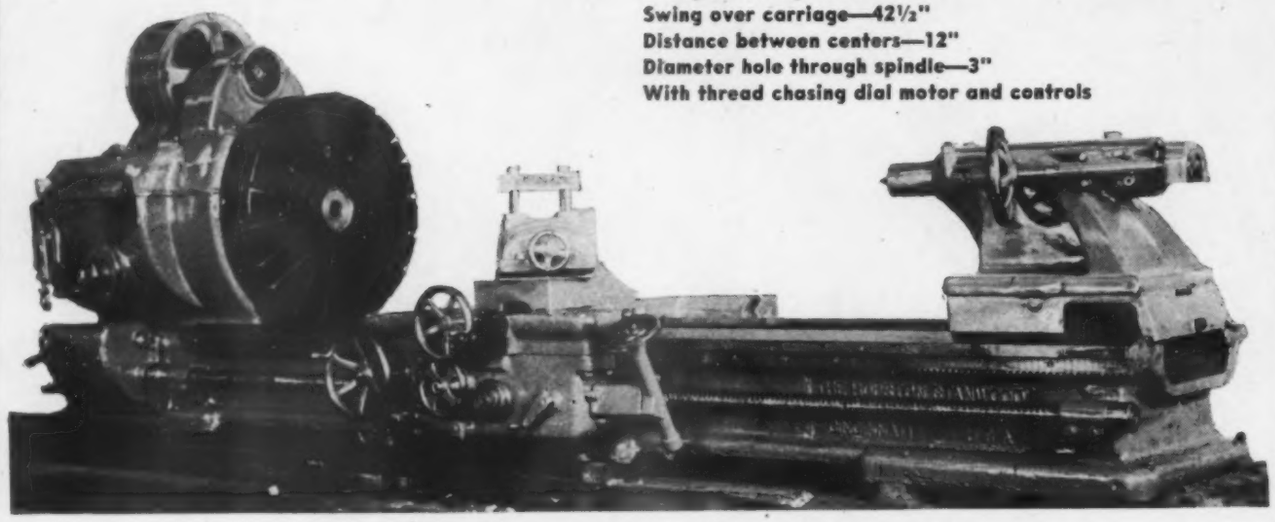

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#72A3 HEALD Plain & Sizematic, M.D.
#4T SELLERS Tool Grinder, M.D.
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#5 B & S Plain Grinder, M.D.
#11 BLANCHARD Rotary, 16"x20" chucks.
#18 BLANCHARD Rotary, 30"x36" chucks.

LATHES

AMES Precision Bench Lathe, 1" Collet Cap., M.D.
14"x54" LODGE & SHIPLEY G.H. Lathe, M.D.
12" & 14" x 30' LODGE & SHIPLEY G.H. Lathe, M.D.
12"x30" MONARCH Mod. "C" Lathe, M.D.
16"x6' SEBASTIAN Lathe, M.D.
24"x108" centers MONARCH Mod. "N", M.D.
50"x17" centers LEBLOND "BIG SWING" Lathe, M.D.

MILLING MACHINES

#5/60 CINCINNATI, Duplex Hydromatic Milling Machine, tracer control mechanism for automatic rise & fall of spindle carriers, M.D., machine used six months.
#1G & 2G KEMPSMITH All Geared Univ., M.D.
#2MS CINCINNATI Dial Type, Plain, M.D.
#4MS CINCINNATI Dial Type, Plain, M.D.
#3HS CINCINNATI Dial Type, Vert., M.D.
#4 CINCINNATI "HI-POWER" Vert., M.D.
#5H KEARNEY & TRECKER Plain, M.D.
#1H-12 KEARNEY & TRECKER MFG., M.D.
#M-50A TAYLOR & FENN Vert., M.D.
#12-M MOREY 2-spdle PROFILER, M.D.

TURRET LATHES

#0G B & S Auto., M.D.
#0 B & S Wire Feed Screw Machines, M.D.
#2G Morey Ram Type, M.D.
#2 B & O Geared Elec., M.D.
#3 W & S Ram Type Univ., M.D.
#3 J & L Ram Type Univ., M.D.
#5 J & L Ram Type Univ., M.D.
#1A W & S Saddle Type Univ., M.D.
#2A W & S Saddle Type Univ., M.D.

MISCELLANEOUS

6'x48" THOMPSON Broach Grinder.
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1½" Dble. Head LANDIS Thdg..Mach..M.D.
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12"x84" centers L & S, m.d., in base, taper
13"x30" centers P & W Model B, m.d. in base, taper
13"x48" centers P & W Model B, m.d. in base, taper
14"x30" centers American Pacemaker, m.d., latest
14"x30" centers L & S, m.d. in base, latest
14"x54" centers Hendey, m.d. in base, taper, collets, latest
14"x6' bed Hendey Geared Head, m.d., taper
14"x6' Pratt & Whitney, cone, taper
14"x6' Sidney, m.d. in base
14"x8' Pratt & Whitney, cone
16"x30" centers Pratt & Whitney, m.d. in base
16"x6' Bradford, cone
16"x6' Hendey Geared Head, m.d.
16"x6' Lodge & Shipley Selec. Head, m.d.
16"x30" centers Lodge & Shipley, m.d. in base, taper, latest
16"x30" centers Monarch, m.d. in base
16"x8' Cincinnati, m.d. in base
16"x8' Lodge & Shipley Selec. Head, m.d., taper
17"x8' LeBlond, cone
18"x48" centers Monarch, m.d. in base, latest
18"x7' Hendey Geared Head, m.d., taper
18"x8' American Geared Head, m.d., taper
18"x8' Champion, cone
18"x8' Hendey Geared Head, taper
18" x8' Lodge & Shipley, cone
18"x12' American Geared Head, taper
19"x10' LeBlond Geared Head, m.d.
19/38"x12' LeBlond Sliding Bed Extension Gap, cone, taper
20"x48" centers American Pacemaker, m.d., latest
20"x48" centers Monarch Geared Head, m.d. in base
20"x48" Reed-Prentice Geared Head, m.d., taper
20"x8' Cisco, cone
21"x12' LeBlond, cone, taper
21"x18' LeBlond, cone
22"x70" centers Greaves-Klusman Geared Head, m.d., taper
23"x12' LeBlond Geared Head, m.d., taper
24"x10' American, cone
24"x10' Greaves-Klusman Geared Head, m.d., taper
24"x10' Hendey Geared Head, m.d.
24"x144" centers American Geared Head, m.d., taper, latest type
24"x12' Reed-Prentice Geared Head, m.d., taper
24"x14' American Geared Head, m.d.
24"x14' Boye & Emmes, cone, taper
24"x20' Lodge & Shipley, cone, taper
26"x16' Boye & Emmes, m.d., taper
27"x18' LeBlond Geared Head, m.d.
30"x26' Lodge & Shipley Selec. Head, m.d.
36"x12' Lehmann Geared Head, m.d., taper, latest
36"x18' Lodge & Shipley Selective Head, taper
36"x21' centers Putnam Geared Head, m.d.
36"x28' centers Niles H.D., m.d., p.r.t., 2 carriages, latest
36"x30' Lodge & Shipley Selec. Head, m.d.
36"x32' centers Putnam Geared Head, m.d., 2 carriages
50"x204" centers LeBlond H.D. Geared Head, m.d., taper, latest

PLAIN MILLING MACHINES

No. 000 Brown & Sharpe, m.d., latest
No. 0-8 Cincinnati Plain Automatic, m.d.
No. 1A Milwaukee, m.d.
No. 1M Cincinnati, m.d.
No. 1½, 2 Cincinnati, cone
No. 2B Brown & Sharpe, m.d. in base, latest
No. 2 Cincinnati High Speed Dial Type, m.d., latest
No. 2L Cincinnati, m.d. in base
No. 2MH Cincinnati, m.d. in base, latest
No. 2HL Milwaukee, m.d. in base, latest
No. 3B Brown & Sharpe, m.d. in base, latest
No. 3S Cincinnati, m.d.
No. 3 Oesterlein, cone
No. 4B Brown & Sharpe, m.d.
No. 4 Cincinnati H.P., m.d.
No. 4 Cincinnati H.S. Dial Type, m.d. in base, latest
No. 5 Heavy Brown & Sharpe, m.d.
No. 5 Cincinnati High Power, m.d., Timken
No. 5 Heavy Duty LeBlond, s.p.d.

UNIVERSAL MILLING MACHINES

No. 4A Brown & Sharpe, m.d.
No. 4G LeBlond H.D.

SAWS

6x6" Peerless Universal Shaping, m.d.
9x9" Peerless Hack, belt
6x6" No. 6 Armstrong-Blum Marvel, m.d., latest
7½ H.P. Cincinnati Elec. Tool Abrasive Cut-off Machine, type JCAW
No. 3 and 8 Nutter & Barnes Cold
No. 6 Cochran-Bly Cold
No. 11½ Higley Cold
Gustav Wagner Cold, m.d., 28" blade
No. 138 Espen-Lucas Cold, 30" blade

MANUFACTURING TYPE MILLING MACHINE

No. 56-72 Cincinnati Duplex Hydro., m.d., latest
No. 56-90 Cincinnati Duplex Hydro., m.d., latest
No. 00 Sundstrand Hydr. Feed Rigidmill, m.d., latest
No. 0-8 Cincinnati EA Plain Automatic, m.d., new Type P Ohio Mfg. Type, m.d.
No. 1-12 Cincinnati Plain Automatic, m.d.
No. 1-18 Cincinnati Plain Automatic, m.d., latest
No. 2-24 Cincinnati Plain Auto., m.d., latest (2)
No. 2-24 Cincinnati Plain Automatic, m.d., with rise and fall attachment, latest (3)
No. 2 Sundstrand Electromill, m.d., latest
No. 3A Sundstrand Copy Rigidmill, m.d.
No. 3-24 Cincinnati Plain Hydromatic, m.d., latest
M24 Milwaukee Simplex, m.d., latest
No. 3-36 Cincinnati Duplex Hydromatic, m.d.
No. 4-48 Cincinnati Plain Hydromatic, m.d., latest
No. 34-36 Cincinnati Duplex Hydromatic, m.d., with tracer, latest
CT-36 and CT-54 Lees-Bradner Thread, m.d., latest
10x24" Hanson-Whitney Thread, m.d.
18" Cincinnati Mfg. Type, m.d.
18", 24" Cincinnati Plain Automatic, m.d.
24" Cincinnati Duplex Automatic, m.d.
48" Cincinnati Duplex Automatic, m.d.
Hall Planetary Thread, m.d.
4" Pratt & Whitney Spline, m.d.
4½x12", 6x14", 6x20", 6x48", 6x80" Pratt & Whitney Thread, m.d.
24"x6' Ingersoll Slab, m.d.
30"x36"x12' Ingersoll Slab, m.d., 2 rail heads
36"x24"x8' Ingersoll, m.d., 1 rail, 2 side heads
Burr Mfg., 72x11" table
No. 2 and 12 Pratt & Whitney Lincoln Type

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No. 2 Cincinnati Med. Speed Dial Type, m.d., latest
No. 4 Cincinnati High Power, m.d., latest
No. 2H, 4H Milwaukee, m.d., latest
No. 2K, 3K, 4K Milwaukee, m.d., latest
Bridgeport Universal Vertical, m.d., latest
Cincinnati Hydromatic Vert., 2 vert. spindles, m.d.
No. 2M Cincinnati, m.d.
No. 2, 3, 4 Cincinnati H.P., m.d.
No. 2½B, 3B, 4 Milwaukee, m.d.
No. 3V Van Norman, m.d., latest
No. 3V Toledo, s.p.d.
No. 5 Reed-Prentice, m.d., latest type
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d.
No. 28-60 Cincinnati 2 spdl. Hydro-Tel, m.d., latest
No. 36V Van Norman, m.d.

TURRET LATHES AND SCREW MACHINES

No. 1 Cincinnati-Acme Semi-Universal, m.d., bar
No. 1 Cincinnati-Acme Semi-Univ., m.d., chucking
No. 1L Gisholt Univ. m.d., chucking, Timken, late
No. 1L Gisholt as above, long bed types
No. 1A Warner & Swasey Universal, m.d., chucking, preselcetor head, latest type (2)
No. 1A Warner & Swasey Universal, m.d., chucking
No. 1A Warner & Swasey Universal, m.d., bar
No. 2 Cinc.-Acme Full Univ., m.d., chucking, latest
No. 2 Cincinnati Acme as above, long bed type
No. 2L Gisholt Universal, m.d., chucking, Timken
No. 2L Gisholt as above, long bed types
No. 2 Pratt & Whitney Shaver, m.d.
No. 2 W & S All Geared Head, m.d., bar, latest
No. 2A Warner & Swasey, m.d., preselector head, cross sliding turret bar, latest type
No. 2A Warner & Swasey, m.d., bar
No. 2A Warner & Swasey, m.d., chucking
No. 2B Foster Universal, m.d., chucking
No. 2G Morey Ram Type, bar
No. 3 Cincinnati Acme Full Universal, chucking, cross sliding turret
No. 3S Cincinnati Acme Fixed Center Universal, m.d., chucking, latest
No. 3 Foster Geared Head, bar, m.d.
No. 3B Foster Universal, m.d., bar
No. 3L Gisholt, m.d., chucking, Timken
No. 3 Warner & Swasey Universal Ram Type, m.d. in base, chucking, latest
No. 3 Warner & Swasey as above, bar
No. 3A W & S, m.d., chucking, latest type
No. 3A Warner & Swasey, m.d., chucking, Timken
No. 3A Warner & Swasey, m.d., bar
No. 4 Gisholt Universal, m.d., chucking
No. 4 Warner & Swasey Universal, m.d., preselecter head, chucking, latest
No. 4 Warner & Swasey as above, bar
No. 4 Warner & Swasey, cone
No. 4 Warner & Sawsey Universal, cone
No. 4A Warner & Swasey Universal, m.d., chucking, 8" hole, latest
No. 4A Warner & Swasey, m.d., chucking, 7½" hole, Timken, late
No. 4R Cincinnati Acme, m.d., bar
No. 5 Foster All Geared Head Universal, m.d., Timken, chucking
No. 5 Jones & Lamson Universal Ram Type, m.d., chuck, latest
No. 5 Warner & Swasey Universal, m.d., preselector head, bar, latest
No. 5 Warner & Swasey, as above, chucking
No. 5 Warner & Swasey, older type, Timken
No. 7 Bardons & Oliver Geared Head, bar, m.d.
2½" Jones & Lamson Universal Saddle Type, m.d., bar, Timken
2½x24", 3x36", 3½x32" Jones & Lamson Flat Turret, bar and chucking types, m.d.
2 spindle 3x36" Jones & Lamson, chucking
3¼" Cincinnati Acme Geared Head, bar
18" and 26" Libby Turret, m.d., chucking
24" and 28" Gisholt, cone

PLANERS

24"x24"x6' Gray, 1 head, belt
24"x24"x10' Whitcomb-Blaisdell, 2 hds, belted m.d.
30"x30"x12' Cincinnati, 2 heads, belt
30"x30"x14' Gray, 2 heads, belt
32"x32"x16' Gray, 2 heads, belt
36"x36"x10' Niles, 2 heads, belt
36"x36"x18' Niles-Bement-Pond, 2 heads, reversing
36"x36"x20' Cincinnati, 2 heads, belt
36"x36"x20' Gray, 2 heads, belt
38"x38"x20' Gray Spiral Drive, 2 heads, belt
42"x36"x12' Cincinnati, 3 heads, reversing m.d.
42"x42"x26' Gray, 2 heads, belted m.d.
48"x48"x12' Gray Maximum Service, 4 heads, reversing m.d., late
48"x48"x32' N-B-P, 4 heads, reversing m.d.
48"x48"x28' Cincinnati, 4 heads, reversing m.d.
48"x48"x30' Cincinnati, 4 heads, belted m.d.
48"x48"x32' N-B-P, 4 heads, reversing m.d.
48"x48"x40' Sellers, 2 heads, reversing m.d.
62"x62"x40' Cincinnati, 4 heads, reversing m.d.
60"x60"x40' N-B-P, 4 heads, reversing m.d.
72"x72"x24' N-B-P, 4 heads, reversing m.d.
72"x72"x36' Niles, 4 heads, reversing m.d.
96"x72"x18' Pond, 4 heads, belted m.d.
P10 Coulter Crank Type Shaper Planer, 1 hd. m.d.

PRESSES

No. 20 V&O Stiles Type, m.d.
Chambersburg 50 Ton Hydro-Pneumatic
B45 Metalwood Hydro-Pneumatic
B33 Metalwood Hydro-Pneumatic

SHEET METAL MACHINERY

Gray Turret Hd. Metal Cutter, 36" throat, ¼" cap.
Southwark Rot. Metal Cutter, 36" throat, ⅜" cap.
120" No. 100 Niagara Heavy Production Folder, 16 ga., m.d.

SLOTTERS

6" Model B P & W Vertical Shaper, m.d., latest
12" Bement-Miles, m.d.
15" Canada, m.d.
48" Niles-Bement-Pond Geared, reversing m.d.

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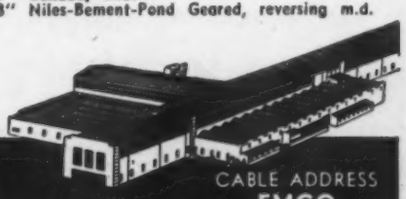

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1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS
EMCO

UNITED MACHINE TOOLS

DRILLS

4'9" CINCINNATI - BICKFORD Super - Service RADIAL—elec. column clamp—2 speed motor—220-440/3/60 — tapping attachment — LATEST TYPE AND DESIGN—approx. 1943 Mfg.
3'11" CONEDY-OTTO RADIAL — LATE TYPE —motor on arm—220/3/60/1800—1942 Mfg.
#3MS LELAND-GIFFORD—3 spdle—12"-BG—Power feeds on all spdles—LATE TYPE—4-speed motors—440/3/60—#3 MT.
3'9" AVEY Sensitive RADIAL—Belt Drive.
21" CANEDY-OTTO—BG—Upright—#4 MT—220-440/3/60—PF to spdle—V-belt drive—NEW.
16" SIPP—4 spdle—Sensitive—#2 MT-Belt Drive.
16" ALLEN—4 spdle—Sensitive—#2 MT—Belt Drive.
16" CANEDY-OTTO—Floor & Bench—Sensitive—½" chucks—110/1/60—NEW.

GRINDERS

#2 CINCINNATI Centerless "Filmatic"—220-440/3/60—thru feed work rest—infeed work rest and infeed attach.—LATEST TYPE—Approx. 1943 Mfg.
#2 CINCINNATI Tool & Cutter—220-440/3/60—Universal—large assortment of accessories—LATEST TYPE—Approx. 1941 Mfg.
#13 BROWN & SHARPE—Universal & Tool—220-400/3/60—LATE TYPE—With cabinet and extra attachments—1942 Mfg.
#25 HEALD Rotary Surface—with chuck.
10 x 24 NORTON—Special—Cam Grinder—Mtzd.
6 x 18 MONARCH Surface — hand feed — Excello mtzd. spdle—550/3/60—with chuck.
#2 BROWN & SHARPE Surface—6 x 18—hand feed — MD — 220-440/3/60 — LATEST TYPE and DESIGN 1943 Mfg.
#60 HEALD — Cylinder — motor driven — very clean—taken out of service.

LATHES AND TURRETS

16/20x58" LODGE & SHIPLEY—24 speeds—Selective Head—Taper Attachment—220-440/3/60—with extra equipment—LATEST TYPE AND DESIGN 1942 Mfg.
16"x6' SEBASTIAN — Type R-8 speed — Geared Head—Timkenized Spdle—220/3/60—NEW.
20"x54" REED-PRENTICE — 16 speed — Geared Head—Taper attach.—220-440/3/60—with additional equipment—LATEST TYPE AND DESIGN—1942 Mfg.
14" x 30" REED-PRENTICE—16 speed—Geared Head — Taper attach. — 21 collets chucks — 220/3/60—LATEST TYPE AND DESIGN—Approx. 1942 Mfg.
14" x 30" LODGE & SHIPLEY—12 speed — motor in base—TA—chuck—steps—220/440—4-way tool post and other equipment — Approx. 1941 Mfg.
#4 MOREY—Universal Turret—with bar feed, chuck faze plates, turret tools, and numerous collets—LATEST TYPE & DESIGN—Mfg. Nov. 1943.
#3 JONES & LAMSON—Universal Turret—220/3/60—with extras and bar feed—LATEST TYPE AND DESIGN—1943 Mfg.
#4 ACME Turret—Friction Head—Bar Feed—PF to turret—1½" cap.—Belt Drive.

MILLING MACHINES

#3K K&T "MILWAUKEE" Plain Horizontal—power rapid traverse—220-440/3/60 motor in base—LATEST TYPE AND DESIGN—1943 Mfg.
#2K K&T "MILWAUKEE" Plain Horizontal—power rapid traverse—220/3/60—motor in base—LATEST TYPE AND DESIGN—1943 Mfg.
#1½B K&T "MILWAUKEE" Universal — all geared—SPD—double overarm—dividing heads—PF all directions.
#3 CINCINNATI—Plain Horizontal—power rapid traverse—diat type—220/3/60—LATEST TYPE AND DESIGN—1942 Mfg.
#2M CINCINNATI—Plain Horizontal—motor in base—220/3/60—vertical attach.—FIRST CLASS CONDITION.
#2B BROWN & SHARPE—Plain Horizontal—double overarm—dual controls—220/3/60—motor in base.
#2K K&T "MILWAUKEE" Vertical—power rapid traverse — 220/3/60 — PF to head — LATEST TYPE AND DESIGN—1942 Mfg.
#34 OHIO Universal—Belt drive—New dividing heads.
#25 BECKER Plain Horizontal—MD-BG—220/3/60 thru 4-speed drive.
#21 GARVIN—Belt drive—Plain Horizontal.

PRESSES

#DP53 FERRACUTE—40 ton—SS—motor driven 220/3/60—Plain—with side shear—1940 Mfg.
#10, #12 FAMCO—foot—on—stand—NEW.
#1, #2, #3 FAMCO—arbor—bench—NEW.
#3K PERKINS—Screw—NEW.

SAWS

#4C COCHRAN-BLY—Cold—inserted tooth blade—motor drive—220/3/60.
8x16 KALAMAZOO Metal Cutting Band—110/1/60—motor and equipment and contour sawing attachment—NEW.

SCREW MACHINES

#0G BROWN & SHARPE—fully automatic—vertical slide attach.—Serial number over 7000.
#00G BROWN & SHARPE—fully automatic—Serial number over 11,000—Motor driven slotting attach.—Swing stop and equip.—LATE TYPE.
#0 B & S—Fully automatic—Belt Drive
#00G BROWN & SHARPE—fully automatic—Serial number over 14,000—Motor driven slotting attach.—Swing stop and equip.—LATE TYPE.
#R4 NATIONAL ACME—4 spdle—Fully automatic—3½" cap.—220-440/3/60—Complete assortment of equipment—LATE TYPE.

2—2" — 6-spdl. GREENLEE — Automatics — M.D. 1942 Mfg.

SHAPERS

16" GEMCO "LUBRIGARD"—220/3/60—Power rapid traverse—front support—heavy duty—plain—NEW.
24" GOULD & EBERHARDT—Crank-motor driven with 4-speed drive—Very clean.
28" AMERICAN—Back geared—all geared-power feed to head—SPD.
7" LOGAN—floor type—110/1/60—NEW.

SHEARS

30" PEXTO—Power Squaring—motor drive—16 ga.
42" WHITNEY—Power Squaring—16 gauge—Motor 220/3/60—NEW.

MISCELLANEOUS

DIE FILER—Thell #3—motor—220/3/60.
DIE FILER—Harvey "Butterfly"—EL—110/1/60—NEW.
PLANER—Whitcomb—24"x24"x6'—Arr. motor drive—less elec. equip.—1 rail hd.
PLANER—WOODWARD & POWELL—60"x60"x12'—2 rail hds.—1 side hd.—box bed.
HAMMER—BLISS—300#—board drop.
CLUTCH CUTTERS—WALTHAM.

UNITED MACHINERY & TOOL CORPORATION

34 HERMAN STREET **WORCESTER 8, MASS.**

NEW— SURPLUS

High Speed Counterbores and Sets of Drills

High Speed Counterbore Sets

13 Counterbores ¼" to 1"

17 Pilots ⅛" to ¾", 2 Holders

Complete in Wooden Box, $25.00 per set

#1-60 H.S. Drills, 60 Drills, with Stand $10.00 Set

A-Z H.S. Drills, 26 Drills, with Stand $12.50 Set

1/16 to ½" H.S. Drills, 29 Drills, with Stand $13.50 Set

VICTOR MACHINERY EXCHANGE, Inc.

251 Centre St. New York 13, N. Y.

CANAL 6-5575

McDONALD

USED MACHINERY

G & E 24" Cin. 32" Shapers
Cleveland O.S. Planer 36"x8', 2 hds.
Abrasive #34 M.D. Vert. Surf Grinder
Cincinnati D. H. Planer 36"x36"x10', 2 hds.
Monarch 20" grd. hd., M.D. Lathe 16 sp. Speeds Model "M"
Bullard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. #3-A
L & S 18x12' & 20'x10' 20"x8' Grd. Hd. M.D. & 28"x12' Lathes Monarch Model "C"
American 24'x12 grd. hd. lathe, m.d. q.c.g.
Amer. 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck.
Cincinnati #2 Centerless Grinder.
Colburn 60" & 72" Vert. Boring Mills.
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd. S.P.D. Pl. Miller.
Milwaukee No. 3-B Vert. Miller grd. hd., m.d.
Cin-Bick 3' Super Serv. Radial
Gisholt 3R Grd. Hd. M.D. Turret Lathe
W.&S. No. 2A grd. hd. Univ. Turret Lathe, S.P.D.
Foster No. 2F Fostermatic grd. hd. Turret Lathe, M.D.

MONA MEMBER

McDONALD MACHINERY CO.
1531-35 N. B'way, St. Louis 6, Mo.

STOCK TOOLS — *Prompt Shipment*

AUTOMATICS 3½" Cone 4-Spindle (4)
AUTOMATICS 1⅝" Cone 4-Spindle (1)
BOLT CUTTER, No. 22 Murchey, Dble. Hd. (1945)
BOR. MILLS, 2½" bar, Cleveland, M.D.
BORING MILLS, 3" bar Universal.
BORING MILL, Hor. 3½" Landis Floor Type.
BORING MILL, 36" Bullard, "New Era".
BORING MILL, 49" King, 2 heads, M.D.
BROACH, Vert. Hyd. SRV5-42" LaPointe, (1940)
DRILL, Hvy. Duty, No. 513 Baker, No. 6 M.T.
GEAR SHAPER, #75 Fellows, M.D.
GRINDER, Internal, No. 72A5 Heald, 2 Mtr. Hyd.
GRINDER, Plain 14"x72" Norton
GRINDERS, Surf. Nos. 3 & 5 Abrasive
GRINDER, Surf. Hyd. G & L 14"x18"x72"—1942
GRINDER, Surface, No. 25 Heald Rotary
GRINDER, Univ. 12"x72" Cinci Hyd.—1941
LATHE, 24"x16' B & E Grd. Hd.—1940
LATHE 27"x18' Niles "Timesaver," Grd. Hd.
LATHE, 36"x22' N-B-P, Grd. Hd. Q.C.G.
LATHE 38"x19' Putnam, Grd. Hd. Q.C.G., T.A.
LATHE, 42"x50' Putnam, Grd. Hd.
LATHE, Tur. No. 3 W & S (Late)
MILLER, Duplex 24" Cincinnati, Auto.
MILLER, Plain No. 1½ Milwaukee, S.P.D.
MILLER, Plain, Nos. 3S, 4 & 5 Cincinnati.
MILLER, Univ. No. 3S Van Norman.
MULT-AU-MATICS, Bullard Type A, 6 Spdle.
PLANER, Openside, 36"x36"x12' Cleveland
SHEAR, Open End, No. 4 United, cap. 3½"

PARTIAL LIST

LANG MACHINERY COMPANY
28th St. & A.V.R.R. Pittsburgh, Pa.

PRACTICALLY NEW

2500 TON BIRDSBORO HYDRAULIC PRESS

With Automatic Four Station, Fourway Loading Tables, Die Space 96"x58" with 125 HP Motor, 48" Maximum Stroke, 36" Working Stroke, 48" Daylight, 47" Diameter Ram. First Installed in 1944.

IN STOCK FOR IMMEDIATE SHIPMENT
CAN BE INSPECTED AT OUR WAREHOUSE

WINSTON MACHINERY CO., INC.
517 South Delaware Street
INDIANAPOLIS 4, INDIANA

20" Gould & Eberhardt Shaper
12" Vernon Heavy Duty Shaper
B4B NATCO 48-spdl. HOLESTEEL Drill
#3 Allen 3-spdl. Drill #4 MT
#4HS Cincinnati Plain Miller
#3HS Cincinnati Vertical Miller
#1—18 Cincinnati Automatic Miller
#2—18 Cincinnati Automatic Miller
#2—#3—#4—#5 Warner & Swasey Turret Lathes
#3 and #5 Jones & Lamson Turret Lathes

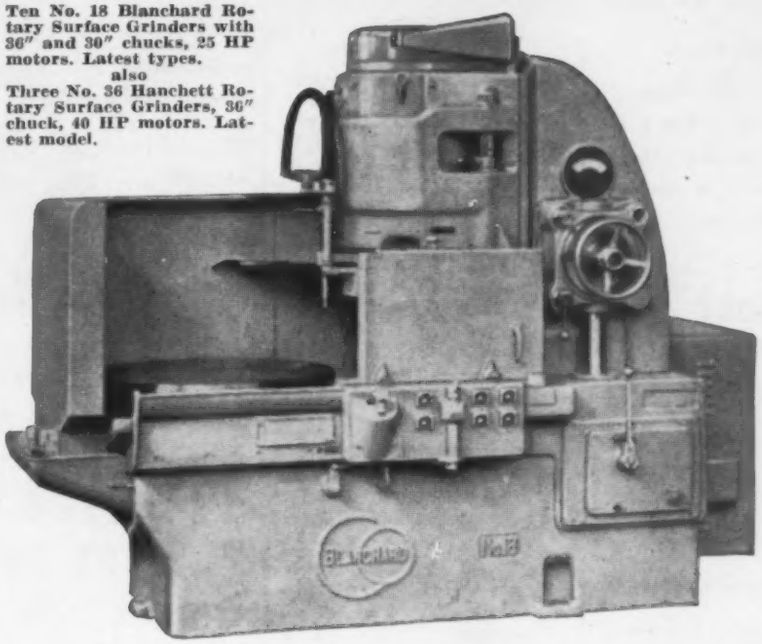
ALL LATEST TYPE MACHINES

HAZARD BROWNELL

350 Waterman St., Providence 6, R.I.

QUALITY *Machine Tools* NOW IN STOCK

Ten No. 18 Blanchard Rotary Surface Grinders with 36″ and 30″ chucks, 25 HP motors. Latest types.
also
Three No. 36 Hanchett Rotary Surface Grinders, 36″ chuck, 40 HP motors. Latest model.



ENGINE LATHES.
LATEST MODELS

10″ x 20″ Monarch Toolmakers Model EE.

12″ x 30″ Pratt & Whitney Toolroom.

16″ x 54″ LeBlond, 12 speed, Taper attachment.

16″ x 72″ Lodge & Shipley, 12 speed, Taper attachment.

20″ x 48″ Lodge & Shipley, 24 speed.

22″ x 48″ Lodge & Shipley, 24 speed.

25″ x 72″ LeBlond, 16 speed, Taper attachment.

28″ x 240″ Bertram, 18 speed, Rapid traverse.

AUTOMATICS

9/16″ RA-6 Acme-Gridley. New in 1943.
1⅝″—8 spindle Conomatic. New in 1942.
2⅝″ RA-6 Acme-Gridley. New in 1943.
5½″ Cleveland Model A, single spindle.
16″ x 33″ Fay Automatic Lathe.

BORING MILLS

No. 41 Lucas Horizontal, 3″ bar. Latest model.

BROACHES

No. 28L LaPointe Hydraulic horizontal, 36″ stroke, approximately 10 ton capacity.
No. CPC 8-24 LaPointe Hydraulic vertical.
No. CPC 5-36 LaPointe Hydraulic vertical.

DRILLS

No. 26HO Baker Vertical, hydraulic, 3″ capacity in steel. Latest type.
4′ Canedy-Otto Radial Drill. New 1946.
42″ Cincinnati-Bickford.
★ No. 3B-12 Edlund, four spindle, with back gear and semi-automatic power feed, m.d. New in 1944.
★ No. 2LMS Leland Gifford Single spindle drill, with hand-hydraulic spindle feed, motor driven. New in 1943.
★ No. 3 Baush Multiple Drill, 20 spindle, No. 2 Morse Taper, rectangular head 20″ x 40″.
Barnes two spindle deep hole drill. Late model.
Taft Peirce double end horizontal drill.

GEAR CUTTERS

16H Gould & Eberhardt Universal Gear Hobber. Late type.
No. 3 and No. 12 Barber-Colman Gear Hobbers.
No. 61 Fellows Gear Shaper, m.d.
No. 7125 and No. 715 Fellows Gear Shaper, m.d.
6″ Gleason Straight Bevel Gear Generator.
★ No. 3616 Cleveland Rigidhobber, spur or spiral gears to 42″ diameter x 16″ face, m.d. New in 1943.

GRINDERS

Bryant No. 16-16 hydraulic chucking grinder. Latest type.
Model 75A Heald internal grinder. New in 1943.
No. 72A3 Heald Sizematic Internal Grinder.
6 x 18 Cincinnati Cylindrical. New 1943.
10 x 36 Landis Plain Hydraulic Cylindrical Grinder. New in 1943.
14″ x 48″ Cincinnati Plain Self contained Grinder. Filmatic-bearings.
No. 13 Brown & Sharpe Universal and Tool.
★ No. 2 Cincinnati Centerless Grinders, with Filmatic spindle, some with through feed rest, others with infeed, motor driven. New in 1940 and 1941.
★ Model B Thompson Hydraulic Surface Grinder, 10″ x 24″ capacity. New in 1942.
14″ x 60″ Mattison Surface Grinder, Hydraulic. Late model.

LATHES, ENGINE

14″ x 6′ Sebastian, motor in base.
16″ x 6′ Hendey, g.h.
18″ x 8′ American, g.h.
24″ x 12′ Monarch helical, g.h.
48″ x 12′ Lodge & Shipley, c.d.
IMP and LR LO-Swing Lathe, m.d., New in 1940.
15″ x 30″ Lipe Carbo-matic. New 1943.
17″ x 50″ LeBlond Production, m.d. New in 1942.

LATHES, TURRET

★ No. 3L Gisholt, cross sliding turret, taper attachment. New in 1943.
No. 1L Gisholt, hydraulic speed change. New in 1943.
No. 1A Warner & Swasey. New in 1943.
No. 4 Gisholt, Universal. New in 1943.
No. 5 Warner & Swasey Universal. New in 1942.
No. 3 Warner & Swasey. New in 1943.
No. 1 Bardons & Oliver, c.d.
No. 1 Brown & Sharpe, m.d.
36″ & 42″ Bullard VTL, New Era.

MILLS

No. 9J Gorton, with tracer.
No. 3 Cincinnati Universal, motor in base, rectangular overarm.
No. 5 Cincinnati Plain High Power Model HO.
No. 4 K & T Milwaukee Plain. New in 1942.
No. 2MH Cincinnati Plain, m.d.
★ 28″ x 60″ Cincinnati Vertical Hydrotel, single spindle, with profile tracing attachment, motor driven.
No. 4 Cincinnati Vertical, high speed dial type, latest model.
No. 2H Milwaukee Vertical, motor in base.
No. 3-36″ Cincinnati Hydromatic Duplex, m.d.
No. 6 Whitney Hand Mill.
Nichols Hand Mill, coolant equipment. New in 1943.

MISCELLANEOUS

No. 7 Kling Structural Punch 72″ throat depth, 1¼″ through 1″ plate.
No. 8-6 Zeh & Hahneman Straight side geared press, bed area 14″ x 14″, stroke 2¼″, 36 ton capacity.

PLANERS AND SHAPERS

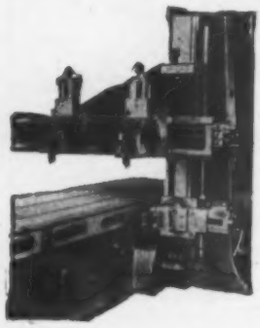
16″ Gould & Eberhardt Crank Shaper, m.d.
20″ American Crank Shaper, m.d.
24″ American Crank Shaper, m.d.
6″ Pratt & Whitney Vertical Shaper.
No. 14 Cochrane & Bly Vertical Shaper.
42″ x 42″ x 20′ Cincinnati Planer, D.C., Rev. M.D.

ALL MACHINES MAY BE INSPECTED UNDER POWER IN OUR WAREHOUSE

INDIANAPOLIS
MACHINERY & SUPPLY CO., INC.
1961 S. Meridian St., Indianapolis 6, Indiana
EASTERN BRANCH: 44 WHITEHALL ST., NEW YORK
MEXICO OFFICE: HIDALGO ORIENTE 2-535-B, MEXICO, D.F.

MACHINE TOOLS FOR IMMEDIATE DELIVERY!

This list of fine machine tools—some new, some rebuilt and some in service in our own shop. Phone for further descriptions. All items subject to prior sale—are now available for immediate delivery. All attractively priced:



Double Housing Planers

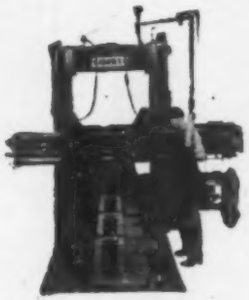
1—24"x24"x8' Liberty. Rail head, 1 Side head. 4-speed overhead motor drive.

1—36"x36"x14' Liberty. 2 Rail heads, 1 Side head. Tool lifters. Speed 0-240' min. Latest type 30 HP G.E. Variable voltage drive.

1—120"x120"x20' Liberty. 2 Rail heads, 2 Side heads. Tool lifters. Latest 75 HP variable voltage drive.

Openside Planers

1—48"x48"x12' Rebuilt Liberty. 2 Rail heads, 1 Side head. Can be equipped with reversing motor or overhead A.C. motor drive.



Convertible Planers

1—112"x76"x28'. 2 Rail heads, 2 Side heads. Lifters. Latest type variable voltage drive.

Air Compressor

1—7½x6 Chicago Pneumatic with 10 HP, 860 RPM, 3 phase, 60 cycle, 220 volt motor control and 24"x5" air receiver.....$450

Cylinder Grinders

1—6x32 Norton C.S. drive $125
1—10x72 B&S C.S. drive $300

Lathes

1—30"x12' Schumacher-Boye Engine Lathe motorized change gear type.....$1200

1—4x60 LoSwing, late type, hardened ways. Motor drive $500

Motors

3 phase, 60 cycle, squirrel cage motors, 220/440 volt.

1—5 HP, 860 RPM, Westinghouse $92

1—7½ HP, 860 RPM, Valley $90

1—10 HP, 1140 RPM, Westinghouse $110

1—25 HP, 575 RPM, G.E. $360

1—50 HP, 1150 RPM, Master (New) $550

Surface Grinders

4—New LaSalle 6"x24" Surface Grinders. Hand operation.

6—New LaSalle 6"x24" Surface Grinders. Hydraulic operation.

Drills

1—24" Barnes 4-spindle Camel back 20"x96" table....$400

LIBERTY PLANERS, INC.

HAMILTON OHIO

Phone Mr. Jenkins—Hamilton 4400

LATE TYPE USED MACHINERY — IMMEDIATE DELIVERY

All Items New Since 1942 — Completely Motorized — In A-One Condition

BORING MILLS

Bullard 36" Vertical
Universal Horizontal 3"
Giddings & Lewis—25 T. Horiz.
Lucas No. 42 Horizontal
Gisholt 44" Vertical
Betts 100" Vertical

GRINDERS

Landis 16x36 Universal
Norton 12x36 Universal
Cincinnati 14x48 Universal
Cincinnati #3 Centerless
Thompson Hyd. 25x18x72 Surface
Covel Surface Grinders

LATHES

Monarch 20"x48" F.H. Ways
LeBlond 32"x32'—2 carriages

MILLING MACHINES

Brown & Sharpe #2 Univ. Vert. Head
Kearney-Trecker #3K Universal

MISCELLANEOUS

Reed-Prentice #5 Jig Borer
Grob W.S. 36" Band Saws
Douglas 10" Vertical Slotter
Cleveland O.S. Planer, 48x48x16'
Cleveland Ridged Hobbers
Fosdick Jig Borer
Peerless 13x13 Universal Saw

Send us your inquiries on your machine tools needed, what we don't have we may locate for you.

NOLL EQUIPMENT COMPANY

2476 E. 13TH STREET — MDNA MEMBER — CLEVELAND 15, OHIO

LATE TYPE TOOLS

#2MH Cinci. Univ. Miller 1944
#3SP Van Norman Miller 1942
Nos. 2, 3, 4, Cinci. Vert. Miller '42, '45
#2, 3, 4 & 5 W. & S. Univ. &
#3 J. & L. Univ. Turret Lathes
#712 Fellows Gear Generator, 1942
36H & 48H G.&E. Gear Hobbers
30"x15' centers Amer. Super Pro. Lathe
18" raised to 24½" x 192" centers, BB Model Monarch, Carr. P R T., '42

BENNETT MACHINERY CO.
30 Church St. N. Y. 7, N. Y.

LANDIS HYDRAULIC CRANKSHAFT GRINDER

PRACTICALLY NEW

Type "C" Universal, 18"x72", Complete with Throw-Blocks.

At Extremely Attractive Price

WINSTON MACHINERY CO., INC.
517 South Delaware Street
INDIANAPOLIS 4, INDIANA

FOR SALE

5" Landis collapsible tap with 5½", 12 pitch chasers. No. 8-A-S J & L Turret Lathe, bar feed, 3 and 4 jaw chucks, extra tooling. 5" bar stock capacity. Both items in new condition.

HOWE MACHINE & SUPPLY COMPANY
1300 FOX, DENVER, COLORADO

Somebody — Somewhere,

needs your idle equipment! Reach that buyer quickly and economically thru the "SEARCHLIGHT SECTION"

The meeting place of Used Equipment Buyers and Sellers

ENGINEERED REBUILT MACHINE TOOLS

BUILT MACHINE TOOLS

ENGINEERED REBUILT

SIMMONS HAS THE HEAVY TOOLS

LATHES

30" x 12' Boye Emmes G H
30" x 18' American G H
42" x 44' LeBlond G H
60"x15' centers Niles G H

RADIAL DRILLS

3½' Cincinnati Bickford
4' Carlton, motor on arm
7' Carlton, motor on arm
8' American, motor on arm

MILLERS

No. 3 Cincinnati Universal
3-A B & S Universal
1-B Milwaukee Universal

BORING MILLS

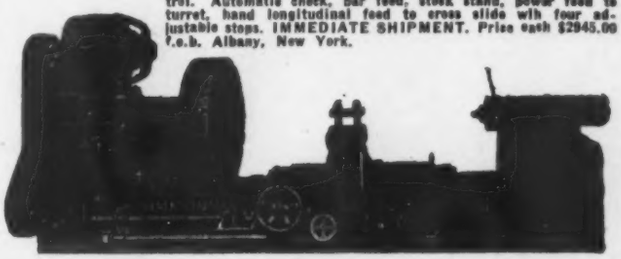
24" Bullard, New Era
62" N. B. P. 2 swivel heads
12' Betts 2 swivel heads
12' N.B.P. 2 swivel heads
16-24' Niles extension type
3" spindle Universal Tri-Way
3⅛" spindle No. 32 G & L
4½" spindle Niles duplex

GEAR HOBBERS

150" Muir gear Hobber
100" G E gear Hobber
18' Power Plant Hobber
40" P. P. Pinion Hobber

Write today for Complete Current Stock List of Simmons *Engineered-Rebuilt* Machine Tools

New No. 2 Simmons Micro-Speed Drive Back Geared Turret Lathe. Bar capacity 1¼". Swing 14". Turret holes diam. 1". Equipment:—3 HP 220/440—3—60 motor and reversing control. Automatic chuck, bar feed, stock stand, power feed to turret, hand longitudinal feed to cross slide with four adjustable stops. IMMEDIATE SHIPMENT. Price each $2945.00 f.o.b. Albany, New York.



48" x 40' Simmons Heavy Screw Cutting Engine Lathe, Geared Head for A.C. or D.C. Motor Drive.

SIMMONS MACHINE TOOL CORPORATION

MAIN OFFICE AND PLANT 1759 N. BROADWAY ALBANY 1, N. Y. NEW YORK OFFICE 50 EAST 42ND STREET

ENGINEERED Machine Tool REBUILDING

BECKER PLANER TYPE HORIZONTAL MILLING MACHINES

Motor: 25 HP—220/3/60—1750 RPM
Table Size: 30" Wide—7'9" Long
Working Area: 26" Wide—6' Long
Maximum Spindle Height from Table to Center of Arbor—24½"
Table Speeds inches-per-minute 16 speeds from .548 to 14.35
Spindle Speeds-8 Speeds from 12 to 78 RPM
Distance Between Housings 36¼"
Length of Cross Rail 6'6"
Has power feed to raise and lower cross rail Spindle Bar.
Two machines just received—Price Each $2500.00 f.o.b. Providence, R.I.

REYNOLDS MACHINERY CO.

303 Eddy Street, Providence 3, R. I.

Gaspee 5187

SURPLUS EQUIPMENT

AVAILABLE FOR IMMEDIATE DELIVERY

#4 Niagara Hand Angle Iron Shear, capacity 2x2x¼ $175.00

#44 Niagara Punch Press $175.00

#327 Niagara Gang Punch, foot operated for punching in line holder in light sheet metal $150.00

#6600 Waterbury-Farrel punch press, cap. 56 ton, vertical back geared, open back, str. sided, stroke 6", 60 strokes per min., 20" shut height, 10"x45" bed size, 5 hp. motor push button switches, V drive, motor 220/440 V, 60 cycle, 3 phase $1750.00

3 ft. American radial drill with motor and belt drive $900.00

Ryerson ⅜" single end punch press $150.00

#12 Marshalltown throatless shear with circle shearing attachment for serpentine sheet steel shearing up to 12 gauge $150.00

Delta model 20-210 cut-off Saw 275.00

#5 Waterbury-Farrel blanking and cupping press $450.00

Coulter power mill, motor driven with 2HP motor, Serial #A-12746 ..... $100.00

#162 Bliss power punch press, about 35 ton cap., 4" stroke, complete with 3HP motor and magnetic starter; practically new $1050.00

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Injection Moulders, Hydraulic Presses

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Baker heavy duty drills. Sizes 121, 217, 217 three spindle, 310, 314 & 315.

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10"x96" Cincinnati type ER plain cylindrical grinder with Filmatic bearings. Brand new.

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---

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LATHES

1—Bridgeford 36"x58', 15 speed, grd. bed., Eng. Lathe, M.D. AC elect. equip. power rap. trav. to carr., compound rest, 2 steady rests, sw. 38" over bed, 26" over carr., dist. betw. cens. 48', mtzd. apron and taper attmts.

1—Bradford 12"x6' Lathe, New, 12 speed, timk. bear., grd. bed., motor in base, latest type.

1—Bridgeford 36"x14' Heavy Duty Eng. Lathe, 9 spds., Gear Hed., AC motor driven, dist. betw. cens. 7'6", sw. 38½".

Lodge & Shipley 27½"x16' Eng. Lathe, sw. over ways 28", sw. over carr. 19½", dist. betw. cens. 10', diam. of tailstock 3½", dbl. bk. grd., motor driven.

1—Rahn-Mayer-Carpenter 27"x14' LCG, sing. bk. grd. cone driven, Eng. Lathe, sw. over ways 28½", sw. over compound slide 17½", dist. betw. cens. 103", hole thru spin. 2½", motor driven.

BORING MILLS

1—Giddings & Lewis #0 Hor. Boring Mill, knee type, diam. of bar 3½", 15 spin. speeds, max. dist. top of tbl. to cen. of spin. 20", cross feed 30", tbl. wkg. surf. 23¾"x45¾", dist. from spin. nose to outboard sup. 84", approx. wght. 9500 lbs.

1—Univ. #3A Hor. Bor. Mill, diam. bar 3", No. 5 taper, rapid mill. feeds, size of tbl. 24"x48", cross feed to tbl. 36", dist. to outer sup. 60", vert. feed to hed. 26", wght. approx. 11,200 lbs. M.D.

2—Bullard 36" "Spiral Drive", face of turret to tbl. 34", clear under cross rail 27¼", vert. trav. of turret 26⅜", clear under S.H. slide 16", 3 and 4 jaw chuck, approx. wght. 17,500 lbs.

1—Bullard 42" "New Era Type" Vert. Bor. Mill, with side hed. coolant crowning attmt., 4 jaw type chuck, capac. 44" diam., 33" cross rail, 43½" under turret face, M.D.

MILLING MACHINES

2—B. & S. #2A Univ. Mill. Machines; tbl. wkg. surf. 45"x11⅛"; feeds-long. 28", cross 10", vert. 18".

1—B. & S. #3 Cone Type, motor driven, Univ. Miller, tbl. wkg. surf. 51"x13¼", feeds long. 34", cross 12", vert. 19".

3—Cin. No. 2M Constant Speed Drive, Pl. Horiz. Millers, tbl. wkg. surf. 40"x10½", range: long. 28", cross 10", vert. 19", 12 spin. speeds, 20-419 RPM.

1—B. & S. 3B, dbl. overarm, Stand. Pl. Horiz. Miller, motor in base, tbl. wkg. surf. 55⅝"x14", feeds: long. 34", cross 12", vert. 20", spin. speeds 16, range 21-496 RPM, motor driven.

1—P. & W. 1½B Jig Borer, tbl. wkg. surf. 12"x 24" feeds long. 18", cross 12" hed. travel on column 7¼", spin. speeds to 1800 RPM (LATE TYPE)

PRESSES

1—Farquhar 100 Ton Hydraulic Press—Daylight 48", stroke 36", approach and return speed 1600' per min.—given max. variation 15%, wght. 44,000 lbs. elect. equip. 440/3/60. (Condition equal to new.)

1—Toledo No. 666 Knuckle Jointed Embossing and Coining Press, capac. 1000 Ton, stroke 2", shut weight 18", width betw. uprights 32", width between gibs 25", wght. approx. 90,000 lbs.

HAMMERS

1—Billings & Spencer 800 and 1000 lb. Board Drop Type Hammer.

1—United 3000 lb. Board Drop Type.

1—Standard Mchy. No. 8, 800 lb. Automatic.

MISCELLANEOUS

1—Sullivan Angle Compounded Air Compressor, Class WJ3, size 14"x8¾"x10", motor driven, elect. equip. 100 HP, 220-3 phase, 60 cycle, complete with tank and fittings. Based on 100 lb. gauge pressure, displacement rating 637 cu. ft. per min. will deliver 531 cu. ft. per min. of actual air.

1—National Mach. Co. 3" Upsetter, steel frame; die box depth 15", width 16¼", dist. from face plate to back of heading tool 43½", approx. net weight 62,000 lbs.

1—Deepfreeze Cascade, 120 degrees Indus. Chilling Machine.

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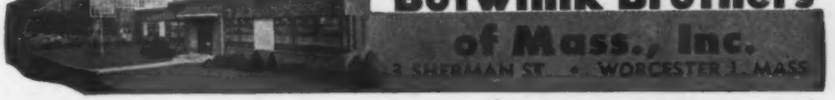

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(1) Giddings & Lewis Floor Type Boring Mill, Model #300, 4½" Spindle, 13'x10' Floor Plate, Purchased New in 1933.

Price $6500.00

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Cincinnati 36"x36"x16 ft. Planer, M.D.

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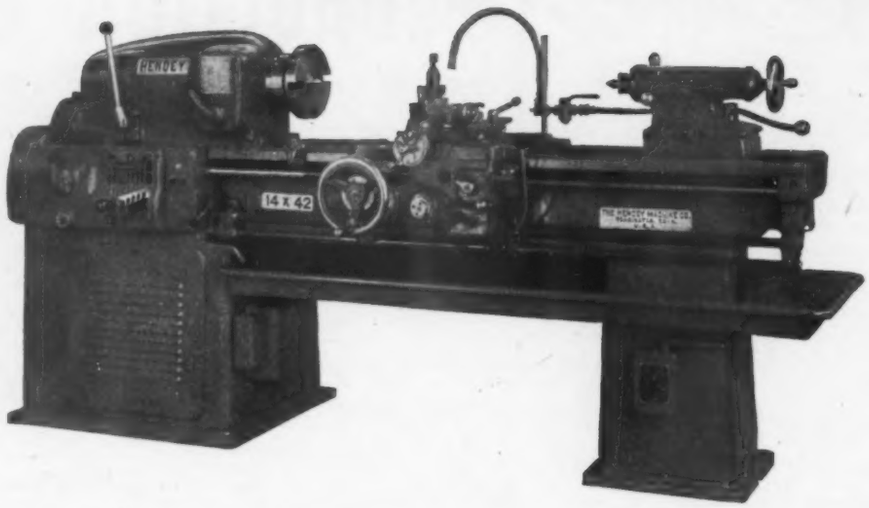
AN OUTSTANDING DEVELOPMENT

THE NEW HENDEY No. 2 GENERAL PURPOSE LATHE



First revealed at the Machine Tool Show, the new Hendey No. 2 General Purpose Lathe is an outstanding development in belt-driven lathes. It offers simpler, safer, faster and more economical operation on all types of light-duty work. Special ingenuity in designing the belt drive and belt shifting mechanism have resulted in two important operational features. First, because the spindle is not directly driven by a belt, but through a gear tooth clutch, belt tension can have no effect on spindle performance. Second, belt shifting has been made 100% safe, simple and fast. The entire belt, pulley and clutch arrangement is fully enclosed. To shift the belt, all the operator need do is pull the belt-shift lever toward himself, move it right or left to engage in the position indicated on the Spindle Index Plate. Four initial spindle speeds are immediately available and, when combined with the back gears, the number is increased to eight, ranging from 30 to 1142 r.p.m.

Other important features of the new Hendey No. 2 include a quick change gear box offering 48 different thread and feed changes, preloaded anti-friction bearing mounted spindle, automatic lubrication throughout, super precision lead screw, bridge truss bed construction and spindle accurately indexed for multiple thread cutting.

The new Hendey No. 2 is truly the last word in belt-driven, general purpose lathes. It will pay you to investigate it thoroughly. Write for complete details today.

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12" - 14" - 16" - 18" - 20"

SHAPERS
12" - 16" - 20"

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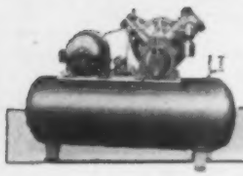
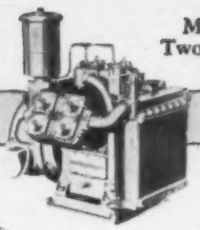
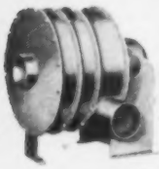


Type 30
Air-Cooled
½ to 15 hp

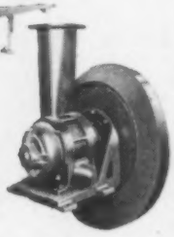


Motorcompressor
Two-stage Air-Cooled
25 to 90 hp

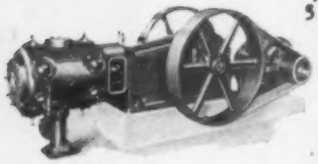
Type G Blower
½ to 2¼ psi
2 to 30 hp



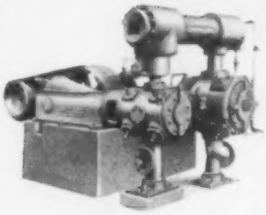
MOBIL-AIR
60 to 500 cfm



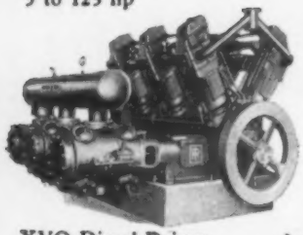
FS Blower
¾ to 3 psi
5 to 250 hp



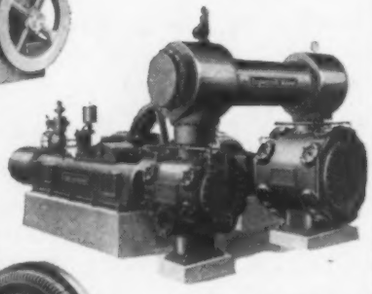
ES Single-Stage
5 to 125 hp



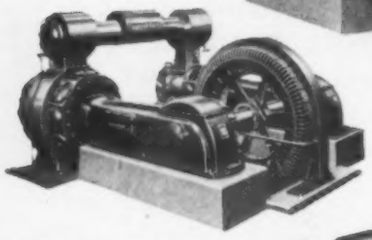
XCB Two-Stage
75 to 300 hp



XVO Diesel-Driven
65 to 275 hp
(also 1200 hp
with gas drive)

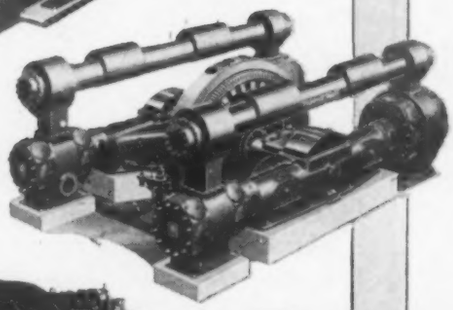


XPV Steam-Driven
50 to 1500 hp

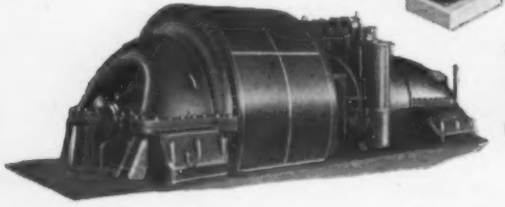


PRE Electric-Driven
300 to 1000 hp

PRE 4-Corner Type
1000 to 3000 hp



Turbo-Blower
up to 30,000 hp



☐ *Centralized*
☐ *De Centralized*
☐ *Combined*

LET I-R HELP YOU REACH YOUR DECISION

No matter which system you choose, you can select Ingersoll-Rand compressors to meet your requirements . . . from ½ to 30,000 hp . . . for any pressures or vacuums . . . air-cooled or water-cooled types . . . electric-motor, steam, gas, or diesel-engine drive . . . stationary or portable.

But first of all, choose *the system* that will give you Air Power where you need it, when you need it, and at the lowest possible over-all cost. What about your plant flexibility . . . floor space available at scattered locations where you *use* the Air Power as compared to space for a central plant . . . the availability and relative merits of electricity, steam, gas, or oil to drive the compressors . . . load factors and load cycles . . . attendance and maintenance?

These are just some of the questions you must run down before deciding upon a centralized, de-centralized, or a combination Compressed-Air System. These are the questions which the I-R Air-Power Specialist can help you answer.

Ingersoll-Rand

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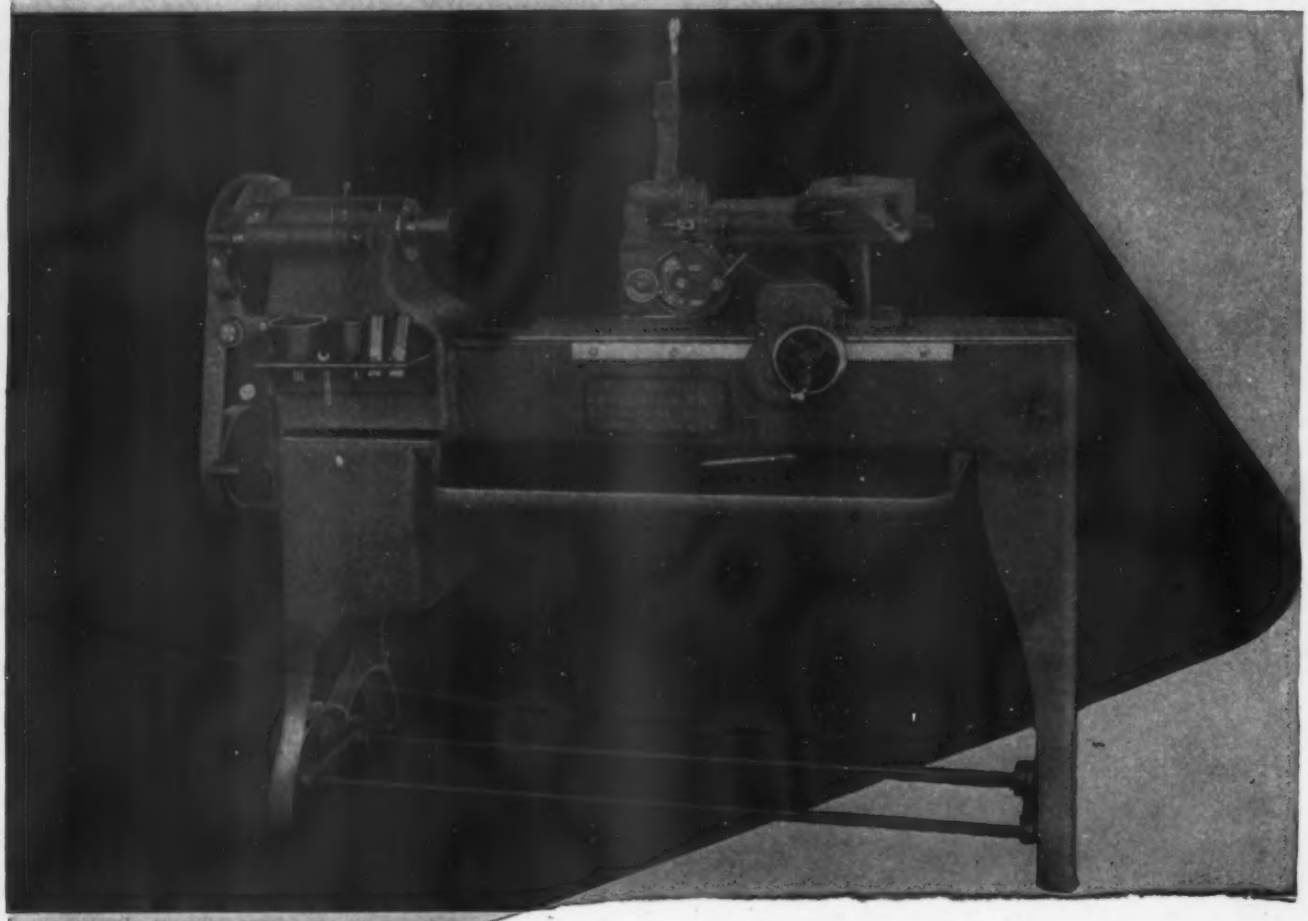
CORRECT CENTERING...
is an IMPORTANT OPERATION



The Hanson-Whitney Rapid Precision Centering Machine has solved the problem of accurate, rapid centering of bright rolled stock, or parts produced on bar machines where centers are required for a succeeding operation. The correct principle of rotating work in center-rest is utilized. Center is drilled and shaved in separate operations. Center-rest is quick-acting roller type, instantly adjustable for diameter through observation dial. The unique, quick-acting work chucks, in conjunction with foot-treadle operation, enable varying diameters to be handled with the utmost speed and accuracy.

Write for descriptive folder today.

Hanson-Whitney

MACHINE COMPANY

HARTFORD • CONNECTICUT

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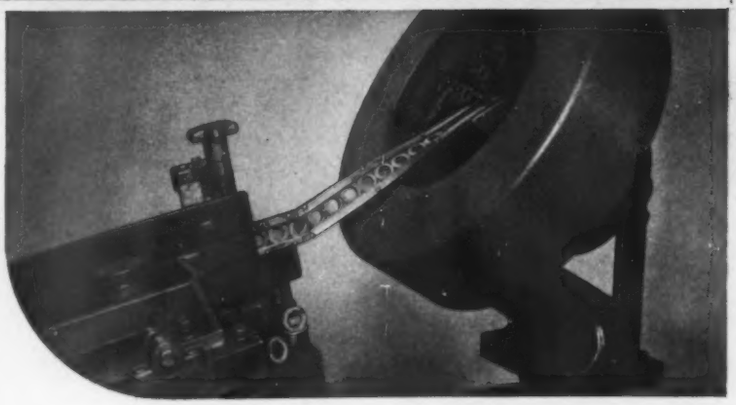
200 *asbestos washers* PER MINUTE by *Automatic*

GARDNER-GRINDING

with a *hopper feeder* for small circular parts



WHEN small parallel-surface parts can be fed with a hopper, production from a modern Gardner Double Grinder is stepped up — and extreme accuracies are still obtained.

Here are 1¼" O.D. asbestos washers, ground on a Gardner No. 115-15" PRECISION Double Grinder, at the rate of *200 per minute*. They are fed from a rotary hopper, down an inclined chute to a belt-type feeding attachment, which carries them through in a continuous stream between the opposed grinding wheels. A cost-cutting, fully AUTOMATIC operation — operator merely keeps the hopper filled.

Read the right-hand panel for the complete production story — then

Use Modern GARDNER WIRE-LOKT Abrasives on YOUR Disc Grinders!

WORK DATA

Part Washer — 1¼" O.D.
Material Asbestos composition
Operation Grind parallel faces
Tolerances .0005" for flatness; .001" for parallelism
Stock Removal .015" to .020" Maximum overall
Production 200 pieces per minute
Machine Gardner No. 115-15" Double Grinder

WRITE FOR OUR *Double Grinder* BULLETIN!

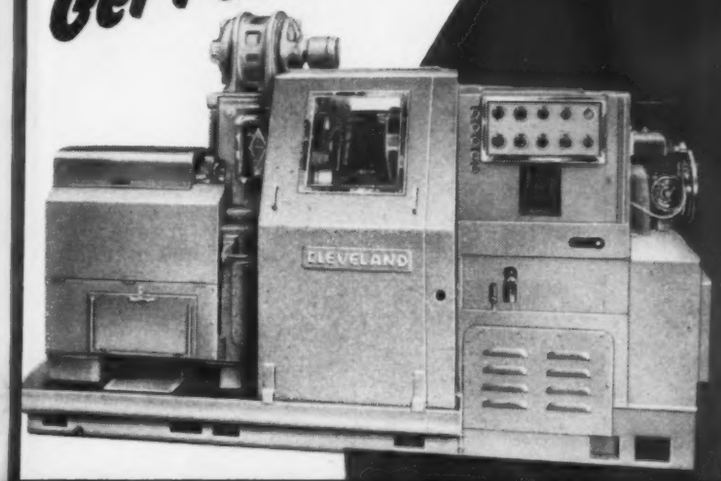
GARDNER-GRIND YOUR *Flat* SURFACES

GARDNER MACHINE COMPANY

410 East Gardner Street · · · · Beloit, Wisconsin, U.S.A.

Investing in More Production at Lower Cost?

Get Posted on the new DIALMATIC CLEVELAND



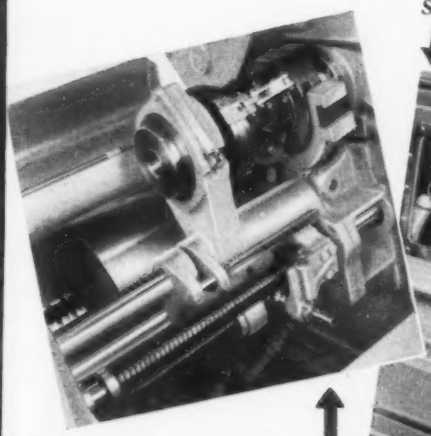
Model AB 2½" Single Spindle Automatic

Design and Construction Features

The new Model AB *Dialmatic* Cleveland sets the pace in single spindle automatic screw machine design. Listed below are the principal construction highlights. Some are time-tested features which have made Cleveland the leader in its field for nearly 60 years—others are highly advanced improvements. All combine to greatly increase the speed of set-up and flexibility of control vital for higher production at lower cost.

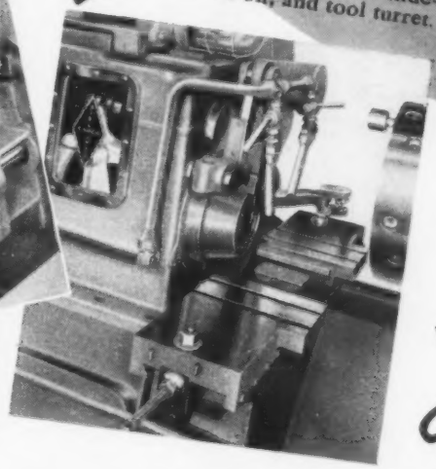
- Universal camming
- Infinitely variable electric tool feed drive
- High speed index independent of tool feed
- Four automatic spindle speeds
- 112 speed selections from 24 to 1820 rpm.
- Hand crank stock feed adjustment
- Timken bearing equipped spindle
- Draw-in type chucking
- Geared anti-friction spindle head
- Five hole turret
- Double cross slides
- Oil feed through turret
- Pump driven lubricating system
- Coolant system with pump drive
- Convertible to a chucker
- Independent cut-off

Electric panel showing feed calculating chart and separate dials for controlling forward and return feed for each turret position.



Stock feed hand crank adjustment and latch construction for holding feed tube assembly.

Spindle head, cross slides, independent cut-off, and tool turret.



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Remember,

Cleveland's Cut Costs

THE CLEVELAND AUTOMATIC MACHINE COMPANY

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CHICAGO (6) 1408 Civic Opera Bldg. CLEVELAND (14) 1114 NBC Bldg. DETROIT (2) 540 New Center Bldg.

HARTFORD (1) 529 Capital National Bank Bldg. NEW YORK (6) 2402 Singer Bldg.

Bullard Man-Au-Trol gets precision and rigidity with Timken bearings

TREMENDOUSLY heavy cuts, high speed automatic operation . . . two big reasons why absolute rigidity and precision are necessary in the Bullard Man-Au-Trol Vertical Turret Lathe. How does Bullard get them? With Timken bearings.

Timken bearings on the work table and throughout the drive of this outstandingly successful machine keep gears and shafts absolutely rigid, yet free to rotate with minimum friction. Maximum support is provided by the line contact between the tapered rolls and races of the bearings. Work table precision is further insured because the Timken bearing is a "Generated Unit Assembly"—no need for breaking-in or final adjustment on the job. The Timken fine alloy steel used in Timken bearings makes the bearing normally outlast the machine itself. Due to their tapered construction, Timken bearings can be accurately pre-loaded.

Whatever type of machine you buy or build, it can benefit from the increased rigidity and precision Timken bearings make possible. And remember, no other bearing can give you *all* the advantages you get with Timken bearings, The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best.

31 TIMKEN BEARINGS AT VITAL POINTS

One or more Timken bearings are used on these parts—a total of 31 Timken bearings.

- Table Spindle
- Input Pulley
- Clutch Shaft
- Intermediate Shaft
- Back Shaft
- Pinion Shaft
- 1st and 2nd Ram Feed Bevel Gear Shafts
- Turret Head Feed Bevel Gear Shaft
- Feed Drive Gear Shaft
- Pump Drive Gear Shaft
- Traverse Drive Gear Shaft
- Rail Raising Brackets
- Turret Head
- Turret Lock

POSITIVE ROLLER ALIGNMENT

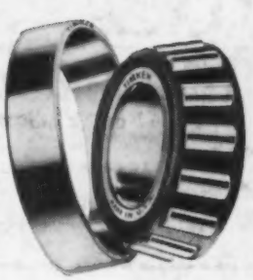
Rollers of Timken bearings are prevented from skewing by the wide area contact between roll ends and rib of the cone . . . a Timken Roller Bearing Company development. Result: bearings roll easier, last longer.

The Timken Roller Bearing Company is the only bearing manufacturer in the country which makes its own steel, and is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL — NOT JUST A ROLLER — THE TIMKEN TAPERED ROLLER — BEARING TAKES RADIAL AND THRUST — LOADS OR ANY COMBINATION